NATIONAL TASK FORCE
ON
REVISED STRATEGY FOR
CONTROL OF MALARIA

(ROSE REPORT)

FINAL REPORT

February 1993

GOVERNMENT OF INDIA/WHO
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TERMS OF REFERENCE FOR THE TASK FORCE TO SUGGEST REVISED STRATEGY FOR CONTROL OF MALARIA IN THE COUNTRY

1. To study the pros and cons of all alternatives and then to recommend strategies to be adopted for malaria control in the country taking into consideration all relevant factors and inter alia the recommendations of the interregional meeting on malaria held in WHO (SEARO), New Delhi from 3-7 February 1992.

2. To recommend specific strategies to tackle malaria problem in the tribal areas separately in respect of 7 states viz. Andhra Pradesh, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Orissa and Rajasthan and the North eastern States of Assam, Arunanchal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura.

3. To review the Malariogenic stratification and action plan for other endemic States being finalized by NMEP and MRC.

4. To prepare project document for obtaining World Bank assistance.

5. To submit an interim report by end September 1992 after which Terms of Reference may be revised in consultation with Ministry of Health & Family Welfare.

6. To submit a final report at the end of assignment.

CONTENTS AND CONTOURS
OF
THE REVISED STRATEGY FOR MALARIA CONTROL IN INDIA

F O R E W O R D

Malaria constitutes a major threat to public health and has blocked the path to socio-economic development of the individual, communities and the country as a whole. Inspite of the best efforts to control and/or eradicate malaria from India under the National Malaria Control and Eradication Programmes NMCP (1953-1958) and NMEP (1958 onwards) respectively, and the subsequent Modified Plan of Operation (MPO) launched in 1977, the disease still remains stubbornly implanted in the country with about 2 million cases and around 300 deaths each year.

Compared to the World situation India's contribution to global malaria is about 2% of the total cases. Among the 9 malarious countries of the South East Asian Region, India accounts for 84% of the population at risk and 71% of the total cases. Though the disease affects both young and adults, in highly endemic (stable) areas like the tribal areas with intense and persistent transmission, malaria is a killer disease for children and pregnant women, where the adults do not face the severity of clinical manifestation. Swellengrebel, a famous malariologist maintained that in areas with stable malaria, man should not interfere with established immunity of human population as that would increase severity of the disease and mortality in older children and adults.

Malaria, in South east Asia, including India, appears to be an old phenomenon, where it is seems that co-evolutionary process involving various elements of malaria system has reached the highest level of adaptation (Kondrashin, A.V.). This might explain the failure of eradicating the disease, inspite of continued use of DDT for 40 years now in the "hard-core" forested tribal areas of central and eastern India. In the eradication era, not only these areas, but the entire country had been subjected to a blanket insecticide treatment and intensified drug pressure with the sole aim to eradicate the disease. Neither the parasite nor the mosquito vector could be eliminated, the situation was rather compounded by the precipitation of resistance in mosquitoes to insecticides and drug resistance in malaria parasite (P.falciparum). Mosquitoes changed their resting and feeding behaviour and as a part of the evolutionary process of adaptation, the malarial parasites now manifest diverse clinical pictures and sometimes even major deviations from typical symptoms.

The procedure of presumptive treatment, in unstable areas where on an average, slide positivity normally, does not exceed 20% or so, the remaining 80% of the fever cases are subjected to antimalarial drugs seems to be highly unjustified. Fevers due to several other infections of bacterial, viral or rickettsial origin have not been given their due place in the primary health care delivery system. Holistic approach of disease managment and control of transmission with selective and cost effective methodologies is the need of the hour.

The hard core malarious areas of India particularly in the 7 states viz. Andhra Pradesh, Bihar, Gujarat, Rajasthan, Orissa, Madhya Pradesh, Uttar Pradesh as well as certain areas of North Eastern parts of the country with rich natural resources have not been able to optimise developmental activities which could have transformed the economic status of these regions and put the communities on national mainstream.

India being a signatory to the Global declaration of malaria control (October 1992) at Amsterdam, will now have to ensure the timely implementation of the strategies, now revised by the task force, in tune with the goal of global strategy envisaging prevention of mortality, reduction of morbidity and socio-economic loss through increased local and national capabilities. Emphasis has to be on capacities for selective and appropriate preventive measures to be guided by redefinition of malaria with the criteria of epidemiological, ecological & socio-economic determinants.

There is no doubt that, though prevention is better than cure, malaria still remains a major public health problem in areas where either: (a) known preventive measures were not fully effective or where their large scale application was not feasible, or (b) the large scale application of preventive measures resulted in the decrease, or even interruption, of malaria transmission, but where malaria resurgence, often in the form of large scale epidemics, could not be prevented, either because of the continuous attrition of routinized control programmes, or because of their inability to deal with new situations of increased risk. The commitment of established control programmes to the continuous application of the same measures consumes the largest proportion of their resources in a pursuit of malaria prevention with progressively diminishing returns. Moreover, the straining efforts of the services to achieve total coverage with house spraying, did not allow them to develop the epidemiological information system, which would have alerted them of the appearance of new, often explosive, problem areas.

These are the main reasons why the current malaria control strategy stresses the selective use of preventive measures, wherever they can lead to sustainable results. Such selection should also aim at the elimination of waste, the interruption of the current deterioration of the malaria problem, the progressive change into sustainable improvement whenever possible and an appropriate contribution to the development of appropriate health services, intersectoral cooperation and community participation.

Key elements in the epidemiology of malaria, which should be taken into consideration, include :

- malaria is focal as well as very variable in its epidemiological characteristics, as a result of the different ways in which man, vector and parasite have adapted to different ecotopes and to the modifications introduced by man.

- malaria control, and even eradication, may still be feasible and sustainable in areas of sociopolitical stability and, as a matter of fact, it has been achieved in most of these areas.

- although malaria vectors have developed resistance to insecticides, in some areas, and P.falciparum has become resistance to the most common antimalarial drugs in most of its area of distribution, still malaria could be prevented, in many situations, if appropriate measures are taken in time.

- the main obstacles to achieving effective control are the economic social and educational barriers typical of the poverty, marginalization, discrimination or rejection, which characterize the populations chronically exposed to high risk. Moreover, although malaria is a disease of poverty, because of its dependence on man-vector contact, it tends to spread following attempts at agricultural development, opening of new colonizations or exploitations of natural resources, to the point that such enterprises often lead to the death or economic failure of the pioneers.

The application of prevention currently faces a number of interrelated problems and obstacles, the most important being related to :

- Excessive, widespread application, particularly of house spraying which is often applied where the risk is very low, or where the effect, for operational or technical reasons is very limited; in both instance, the cost-effectiveness is low, resources are wasted leading to insufficient intervention in areas and situations where the risk is high and prevention of spraying or other methods could be effective;

- Vector control carried out without any epidemiological basis or on the basis of information systems which using only parasitological data and not morbidity and mortality data;

- Lack of use of data originated beyond the malaria services, i.e. in the general health services, by meteorology, by the social and agricultural sector, civil registries etc.;

- Technical deficiencies in the methods used and lack of entomological basis;

- Lack of qualified staff to ensure sound epidemiological targeting, evaluation and assessment of entomological parameters;

- Lack of funds;

- Outmoded managerial practices and administrative problems.

The key element in the proposed revised strategy is a shift from national malaria eradication to decentralized malaria control by district level microplanning and implementation of control measures. Keeping in view the Global Malaria Control Strategy envisaging prevention of mortality, reduction in morbidity and socio-economic upliftment through strengthening of local and national capabilities, the proposed revised strategy includes an analytical overview with recommendations in the following areas :

1. Malaria control in tribal and non tribal rural areas
2. Malaria control in North Eastern States
3. Urban malaria control
4. Decentralized microplanning for malaria control
5. Industrial malaria control
6. Review of malariogenic stratification
7. Critique on National Malaria Eradication Programme (NMEP)
8. Research back up for malaria control
9. Management Information System
10. Intersectoral coordination, Training and Supervision —

The tribals in India constitute only 7.8% of the total population of the country but they account for 40% of the total malaria cases and 60% of P.falciparum cases. The complexity of eco-epidemiological, entomological, social and cultural aspects in tribal areas have always been a great hurdle to the operational feasibility of the national malaria eradication programme. The centralized planning of field operations cannot cope with the demands of local needs. Such centralization has also been a major contributory factor for slow/poor development of technical capabilities at the state/district levels. There is thus a dire need for decentralized micro level planning at district level with regard to epidemiological, entomological, environmental, social and cultural factors in relation to the dynamics of malaria transmission control. The laboratory services at the periphery require strengthening for prompt diagnosis. The

children and pregnant women being most vulnerable groups in tribal areas, prompt diagnosis and treatment require special attention. Intersectoral coordination, involvement of non-government/voluntary organizations and link workers in case detection, treatment and health education are critically important for the success of the malaria control. Most tribal areas being persistent transmission areas, residual insecticides could find selective use depending upon local needs generated by microplan. Feasibility of bio-environmental control measures and personal protection (by use of impregnated bed nets) essentially form an integral part of microplan for malaria control.

Strengthening of primary health care delivery system at all levels is of paramount importance for the successful delivery of health services and the control of malaria as also other common endemic/epidemic diseases. As such, the plan of malaria control very strongly emphasizes the strengthening of basic health services. Strengthening of the district epidemiological cell, as part of strengthening general health care delivery system, with properly qualified & trained district epidemiologist, district entomologist and technicians with a mobile unit for developing microplan, monitoring and evaluation of the control activities

at the district level becomes a necessity. The data generated by the cell can be utilized to build up predictive models for forecasting malaria outbreaks. The management information system (MIS) needs to be developed in an integrated manner at district level capable of generating information which could be used for better management of disease and other control activities, by proper analysis and interpretation. Training at all levels for microplanning, monitoring, evaluation, MIS and implementation of malaria control activities will have to be essentially built up in the overall integrated approach to health care delivery system. The need to mount an aggressive socio-cultural need based IEC programme supported by multimedia and extension education by health workers, should be given highest priority. It is once again reiterated that MIS, IEC, training and manpower development activity should be viewed in a holistic manner at all levels, the district playing a key role. These features of a decentralized microplanning are also the key elements for malaria control activities in rural (non tribal) areas as well as the 7 north eastern states of the country.

The epidemiological data of urban areas are very scanty, however the available information indicates that 128 towns with 9% India's population account for 9% of India's malaria. Due to rapid urbanization and expansion of urban areas, strengthening of urban health services with emphasis on laboratory services in dispensaries and hospitals with properly trained malaria microscopist is essential. District epidemiological cell covering an urban area should be built up to plan, monitor and evaluate urban malaria control activities. Based on their epidemiological intelligence they should give suitable guidance to the urban or municipal authorities. Linkages to be established with non-government/voluntary agencies to assist in IEC for community participation in elimination of domestic and peridomestic breeding of malaria and dengue fever vectors and the use of personal protection methods such as bednets, repellents, etc.

India is going through phase of rapid and tremendous industrial revolution particularly for the economic development of the tribal areas. The problems of industrial malaria are assuming serious dimension due to lack of proper coordination between the management of industry and the state/ district health services, inadequate training of laboratory staff in the laboratories of the in health care delivery systems of industrial complex and absence of an organized infrastructure to look into the magnitude of malaria problem and its control. This has resulted in absence of reliable epidemiological and entomological data in most of the industrial complexes. Governments need to introduce legislation

wherein before setting up an industrial unit, the concerned health authorities need to be informed of the labour movement, constructional and all other related activities that promote mosquito breeding and increase man-vector contact to aid transmission. The health authorities should then undertake active surveillance to prevent epidemics. Where ever industries have been established the health authorities should ensure that adequate steps are taken for the control/ containment of malaria. Bioenvironmental measures and personal protection by use of impregnated bet nets seem to be the feasible options for a sustainable control of malaria and other vector-borne diseases in industrial complexes.

The exercise for malariogenic stratification is a complex process. The stratification need be based on ecological, epidemiological and entomological factors that are most essential in permitting indigenous (autochthonous) transmission (seasonal or perennial). The disease epidemicity/endemicity is a highly dynamic process which is dependent upon a complex of human, vector, parasite and environmental factors which should be critically analyzed using biostatistical tools. Since the parameters involved in the dynamics of disease transmission are highly dependent, data analysis by multivariate analysis of variance (MANOVA) can provide suitable answers for stratification of most areas.

Research back up should form an integral part of control activities. Areas in operational research should be identified and fully supported. The results of all academic and operational researches should be immediately conveyed to the concerned health personnel at the periphery to guide the control activities. Basic research may also be supported in well identified areas at national level to improve upon the methodology of disease diagnosis, prevention and treatment.

India is a poor country and as such it will be most desirable to ensure that the money spent in malaria control activities would be spent on cost effective interventions which will be acceptable to the community and affordable by the systems. From time to time there is urgent need to conduct cost benefit analysis of various components of malaria control activities in different parts of the country. There is also a need to explore the possibilities of malaria control cost retrievals.

There are many sectors that are directly related for successful implementation of malaria control programme in health, education, irrigation, forestry, engineering, social and tribal welfare. Modes and mechanisms for development of intersectoral linkages and coordination between these sectors at different levels of operations i.e. centre, state, district, sub-district, block and local are of paramount importance.

The National Malaria Control Strategy

Since malaria widely varies throughout the India no single prescription can be made for the control of malaria in all areas. Each area specific circumstances will influence the organisation of practicable programmes to identify local problems and priorities and the design of implementation of appropriate interventions. <u>The key is in the competent local action</u>.

The goal of malaria control is to prevent mortality and reduce morbidity and social and economic losses, through the progressive improvement and strengthening of local and national capabilities.

The four basic technical elements of the strategy are :

- to provide early diagnosis and prompt treatment;

- to plan and implement selective and sustainable area specific preventive measures, including vector control;

- to detect early, contain or prevent epidemics; and

- to strengthen local capacities in basic and applied research to permit and promote the regular assessment of country's malaria situation, in particular the ecological, social and economic determinants of the disease.

For effective implementation of the proposed strategy it is necessary that:

- there be sustained political commitment from all levels and sectors of government;

- malaria control be an integral part of health systems, and that it be coordinated with relevant development programmes in non-health sectors;

- communities be full partners in malaria control activities; and

- adequate human and financial resources be mobilized.

Conclusion

The National Malaria Control Programme need a clear sense of direction in reducing the disease burden - malaria control should not be perceived as disorganized eradication. Thus long term planning and budgeting are essential and should be carried out by an intersectoral and intrasectoral team. Plans thus developed need to be sound, clear cut and communicated to and understood at all levels. they should however allow a degree of flexibility in implementation and modification based upon proper assessment. Plans should have an emergency preparedness component. The national plan for malaria control should be development as an integral component of the National Health and National Social and Economic plans.

Data based need to be developed for decision making and for planning and replanning purposes. There is an urgent need to develop the local capability for planning and sufficient resources should be allocated to the planning process. Decentralized intersectoral planning is the key to successful programme implementation.

A more efficient use and redeployment of existing resources based upon a careful analysis and stratification of the problem are critical for sustainability. Malaria control must be actively supported by all levels and integrated into the general health system to the extent possible and where this is cost effective, thereby ensuring the availability of the needed support and greater prospects for sustaining the gains achieved. A major effort must be launched to develop the human resources required at all levels and in all disciplines for successful long term programme implementation. Information, education and communication are crucial for the implementation of the global strategy.

An efficient logistics system is necessary to ensure a constant supply of commodities, particularly drugs. This is also necessary for emergency purposes for which an awareness and readiness plan should be prepared. Further development of the health infrastructure and effective decentralization should strengthen local capacities and responsibilities for the control of malaria and the betterment of health. In this regard intrasectoral cooperation and collaboration are essential.

Community involvement especially in preventive measures and responsibility for the health of the family are major issues for malaria control. The complexity of malaria and its transmission as well as the focal nature of the disease demands flexibility within the programme implementation and mobility.

It is now time to redeem the past and critically take cognisance of each factor that contributed to the failure of the malaria eradication strategy which was prescriptive in its content and application.

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M.D.
Chairman, Task Force

February 1993

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Feb. 1993.

Dr V.K. Saxena
Ph.D, D.Sc.
Member-Secretary
Task Force

CHAPTER 1

INTRODUCTION AND OVERVIEW

During the year of Indian Independence, in 1947, it was estimated that 75 million people suffered from malaria in India with about 800,000 deaths a year. After first 7 years of successful national malaria eradication programme (NMEP) the number of cases due to malaria were reduced to merely 100,000 in the year 1965 with no deaths, and total eradication of the disease appeared to be an achievable goal.

Unfortunately the years that followed, witnessed resurgence of malaria when in 1966 about 148,000 cases were recorded (an increase by 48%). The eradication programme had attained major success in 1965 but still required intensified spraying in about 20 per cent of the country, there was sudden withdrawal, by the bilateral agency, of the commodities which were being procured on loan basis. It is also on record that the Agency had issued no warning at any time before taking such a step and thus there was no opportunity to increase the local production in such a short time. In such a situation not only regular spraying had to stopped in some of the high incidence areas, but even for taking remedial measures in case of focal outbreaks, there was shortage of insecticides. Subsequently in the about next 10 years the number of cases rose fairly rapidly touching a figure of over 5 million cases in 1975-76. This was a crucial stage in the eradication campaign which faltered, after remarkable initial success, due to complex problems. Indepth evaluation of NMEP in mid 70s led to the formation of a Modified Plan of Operation which was launched in 1977 with the aim to prevent deaths due to malaria, reduce morbidity to ensure industrial and green revolution and consolidate the achievements of the malaria control all over the country.

Within 6 years of the launching of Modified Plan of Operation the number of malaria cases were brought down to 2 million by 1983, a reduction by about 40% within 8 years. Though this situation is now almost static for nearly 9 years, with about 2 million cases being recorded each year the proportion of P.falciparum cases have increased from about 20% to nearly 35% of total cases during this period.

In December 1989, a two weeks independent appraisal of the NMEP by national and international experts on malaria revealed (i) gross underestimation of malaria problem in the country due to organizational weakness resulting in poor spray coverage and insecticide resistance among vector species, inadequate surveillance, lack of supervision and inadequacy of laboratory services, resulting in delayed treatment and the spread of drug resistance in P.falciparum.

The reasons attributed to these deficiencies in programme implemented included low priority to the programme, organizational inadequacies, lack of epidemiological approach as well as intersectoral coordination. Malaria today, is not only the problem of this country, the World Health Organization has laid down a global strategy for malaria control which envisages (i) provision for effective disease management by strengthening local and national capacities (ii) development of capacities for selective and appropriate preventive measures (iii) selectivity to be guided by newer eco-epidemiological and socio-economic determinants and (iv) forecasting of epidemics.

In India, malaria assumes a much greater importance particularly in the tribal districts, in view of the socio-economic development of these areas, and the country as a whole. To keep pace with the rapid social and industrial development of the developing world, it is felt that 7 states of India viz. Andhra Pradesh, Bihar, Orissa, Rajasthan, Gujarat, Maharashtra and Madhya Pradesh which are persistent transmission areas with about 80-90% cases of P.falciparum malaria, deserve a newer look for suitable control strategies. special efforts for the control of malaria, as envisaged in this document are also warranted for the north eastern states too, if the region has to witness a speedier socio-economic development.

Due to increased urbanisation and industrialisation, malaria has now become an important urban problem. The process of urbanisation and industrialisation has led to creation of more permanent breeding places for mosquitoes. Added to this has been a phenomenon of large scale migration of rural population to urban areas in search of employment, resulting in larger and more number of urban slums. Faulty planning and construction or urban/industrial infrastructure have resulted in the increase in the mosquitogenic potential of these areas. Similarly, no or poor maintenance in and around the project areas have resulted in the creation of permanent breeding places for mosquitoes. And, the problem of migration of rural labour to urban areas has been more accentuated in the malaria-endemic states, where the parasite reservoirs have also migrated along with the population, thus setting in the process of transmission.

Incidence of malaria and its resurgence

Considering that the epidemiological surveillance was fully established with an overall ABER of 8.7 per cent in the entire country and it was much higher in more malarious areas in 1965, when the amount of total malaria was 99,667, the rate of increase in subsequent years was compared against this base line data.

It may be noted that during the initial phase the rate of increase of malaria incidence in the next three years was 2.7 fold, after which by 1970 (in five years) it escalated by 7 fold. What is most sticking is that a decade later the increase was 50 fold. In case of P.falciparum the increase was 4 fold in the first five years but after another five years it was 28 fold.

In about 10 years period (1966-1976) the number of cases rose fairly rapidly touching a figure of over 5 million cases in 1975-76. Indepth evaluation of NMEP in mid 70s led to the formation of a Modified Plan of Operation which was launched in 1977 with the aim to (i) prevent deaths due to malaria, (ii) reduce morbidity (iii) to ensure industrial and green revolution and consolidate the achievements of the malaria control all over the country. The NMEP was evaluated by national and international experts on many occasions (1960-1989) who suggested/recommended various measures to improve programme implementation to make it more effective. Most of these recommendations, although considered at different point of time and which are still valid, remain unimplemented resulting in gradual worsening of the situation.

Constraints under the MPO

1. Outside the health sector
2. Those within the health sector

Factors outside the health sector

i) Climatological conditions such as excessive rains, floods or drought, population movement and aggregation of labour connected with development projects.

ii) Periodic migration of people from one region to another.

iii) Ecological changes connected with deforestation and extension of irrigation system and irrigated areas.

Factors within the Health Sector

Broadly speaking these can be classified as under :

i) **Organizational** - Inadequate technical leadership at various levels, frequent changes at key posts, vacancies, inadequate training facilities of staff at many levels.

ii) **Administrative and Financial** - Non-availability of adequate funds on time based on technical needs, poor planning and lack of administrative support.

iii) **Logistic support**

a) Insecticide : DDT both indigenous (50 per cent) and imported (75%) are being made available by centre to the State in time and quantities required. However, States using HCH and/or Malathion often delays as these are to be procured by States.

b) Some States are unable to procure in time the needed equipment and accessories because of financial constraints or non-availability at short notice.

iv) **Transport** - Shortage of vehicles is acute in almost all States. According to prevailing policy the States are to procure the vehicles first and later receive the 50 per cent reimbursement. Many States are short of funds and are unable to purchase the much needed vehicles, even those needed for supervision.

v) **Operational** - Deficiencies are on account of combination of most of the factors but more often due to financial shortcomings.

There are also problems of accessibility in difficult terrains especially during wet season. Non-acceptability of the spray operation is another factor which needs special attention.

vi) **Technical**

a) Vector susceptibility to Insecticides - Susceptibility tests carried out regularly with WHO test kits have shown all vectors in North Eastern States continue to be susceptible to DDT. However, An.culicifacies malaria vector in major part of the country has been found to be resistant to DDT and dieldrin wherever tested. In large areas of Maharashtra and Gujarat this species was also resistant to malathion. However, it has been demonstrated that in spite of resistance, if DDT is sprayed with adequate coverage of houses as well as rooms, epidemiological impact is discernible.

b) Entomological Data Analysis - Inadequacy of entomological data on vector bionomics & ecology in areas of insecticidal spray is alarming. Even where meagre data have been generated by zonal entomologists/research organizations, etc. besides being inadequate have not been analyzed for timely modification of spray strategy.

c) P.falciparum resistance to chloroquine, were first observed in Karbi Anglong and Nowgong districts of Assam and thereafter in several States and Urban Territories in N.E. Zone. There are some focl in few other states.

CHAPTER 2

MALARIA CONTROL IN TRIBAL AND NON TRIBAL RURAL AREAS WITH SPECIAL EMPHASIS ON DISEASE MANAGEMENT, PREVENTION AND EMERGENCIES

Tribal areas contribute a major portion of total malaria cases in India. 7.8% of tribal population in the country accounts for about 40% of malaria cases and 60% of P.falciparum cases. In the 7 states viz. Andhra Pradesh, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Orissa and Rajasthan, 5.5% tribal population contributes 30% of malaria cases and 60% of P.falciparum cases. Some of these tribal areas have had malaria since ages where the disease transmission takes place for most parts of the year. The tribal population of each of the 7 states contributes from 31% to 90% of the total malaria of each state. The area inhabited by the tribal population in the 7 states is an ecological continuum varying from, hilly and undulating terrain with forest cover in parts of Bihar, Orissa, Madhya Pradesh and Maharashtra, to sparse xerophytic vegetation in drier areas of Madhya Pradesh, Gujarat and Rajasthan.

Though mortality levels due to malaria in the country are reported to be about 300 per year, tribals account for nearly 75%. From the country's standpoint the state of Gujarat contributes highest number of malaria cases as compared to other states (24.62% of total national figures). However the state of Orissa contributes maximally to the total no. of P.falciparum cases in the country (31.84%) (Fig.1, 2). The ecological and epidemiological conditions prevailing in tribal areas are very complex in nature. These warrant a concerted, multipronged effort to reduce malaria incidence to a more acceptable level with prevention of mortality, so that these areas become open to industrial development for socio-economic upliftment of the tribals as well as for other economically backward classes.

Some of the important features, that justify special efforts, to control malaria in tribal areas include :

1. Children and pregnant women are the most vulnerable groups that get affected by the scourge of mortality in tribal areas, the adults being immune remain asymptomatic carriers.

2. Due to difficult terrain, most areas being unapproachable often result in serious communication gap, and benefits of primary health care do not reach most of the tribal population.

3. Illiteracy and ignorance are factors in community's poor response to health related activities of disease surveillance, treatment, etc.

4. Most tribal areas are predominantly P.falciparum persistent transmission areas.

5. Developmental activity in the tribal areas often gets hampered due to the movement of non-immune labour population in these areas, resulting in focal outbreaks & deaths.

6. There is serious gap in our knowledge on vector bionomics and ecology in relation to ecological diversity.

7. Precise information on the diversity of behavioural and cultural practices in each ethnic tribal population is conspicuously scanty.

FIG. 1

PROPORTIONATE INCIDENCE OF "TOTAL" MALARIA CASES, BY STATES

(Average for years 1988-91)

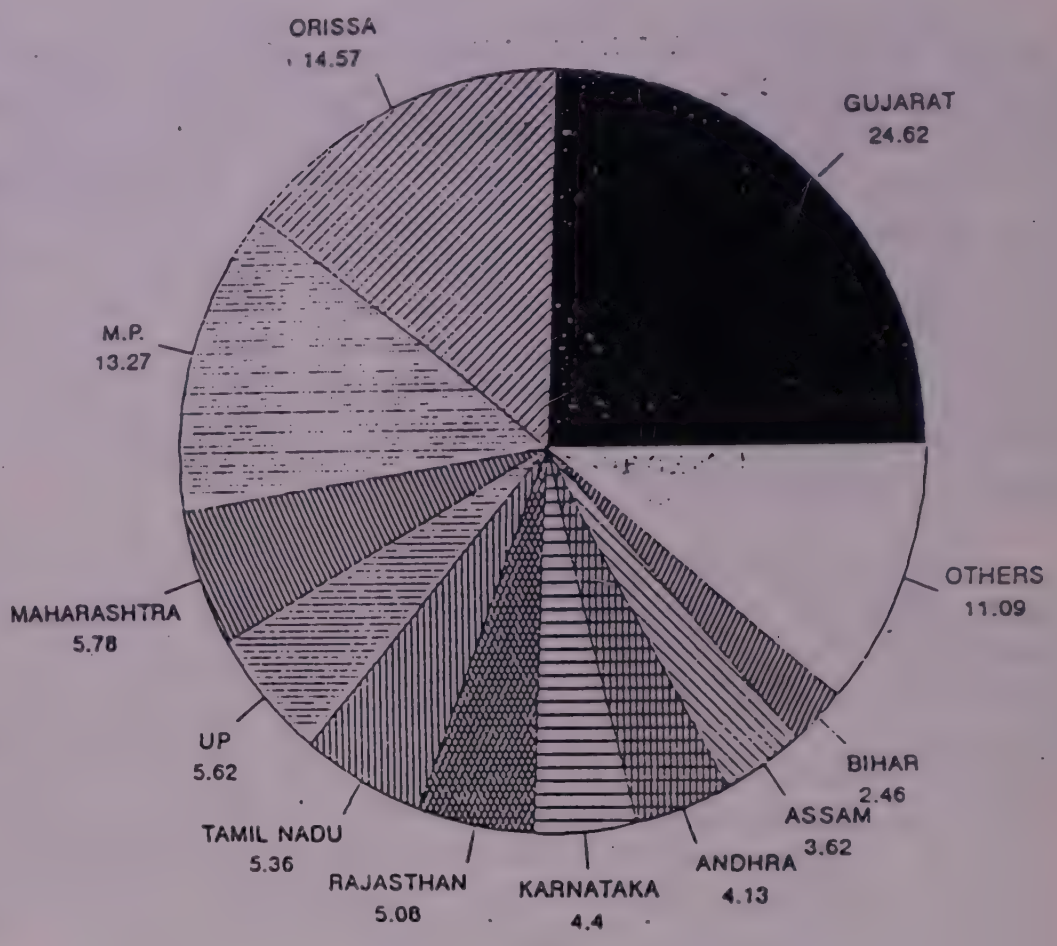
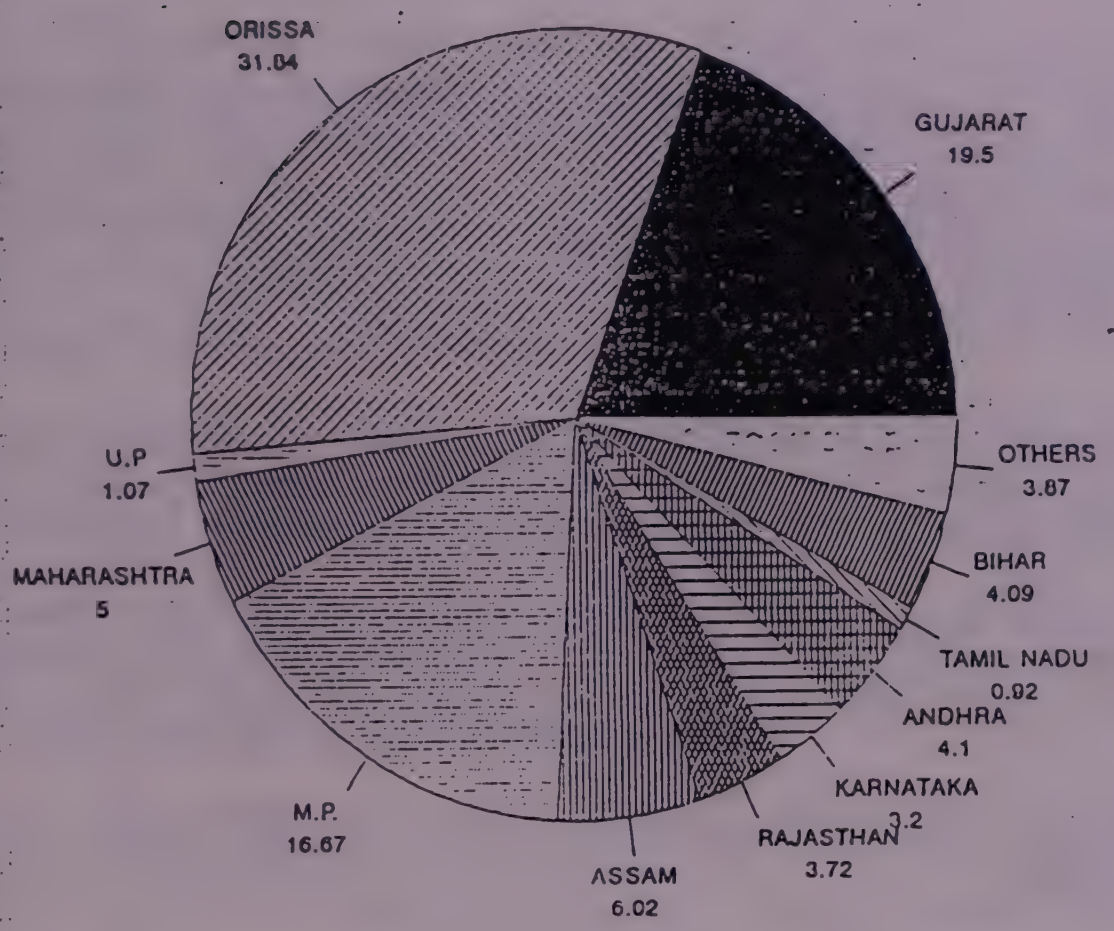


FIG. 2

PROPORTIONATE INCIDENCE OF "Pf" MALARIA CASES, BY STATES

(Average for years 1986-91)



Constraints/Issues of concern:

1. Switchover from vertical to multipurpose working system, though desirable, has resulted in least attention to malaria problem. The multipurpose worker (MPW) has greater incentives for the family planning programme, due to which the surveillance system for malaria is gradually collapsing. Nearly 40% posts of MPWs are lying vacant in the country. There is inadequacy of training and motivation at all levels.

2. Planning process for all malaria related activities have always been centralised during the national malaria eradication programme (NMEP) in the country. Intermediate and peripheral level health personnels have very little flexibility in any operational activity. This centralisation has been a major factor contributing to slow/poor development of technical capabilities at state/district level. India being a huge country, centre has not been able to cope with local demands and needs. This has resulted in gradual loss of technical capabilities even at central level.

3. States have failed to sanction and establish PHCs/sub centres as per prescribed norms. Those established have not been provided with adequate staff, equipment & budget. Inadequate funds and low priority with the state governments are responsible for non establishment of PHCs as per norms. As per government of India norms one PHC with laboratory was to be established at 20,000 population in tribal areas and 30,000 population in other areas. This has not yet been fully implemented yet, to make laboratory services available to the remotest area.

4. There are no career opportunities for malariogists working at the periphery, which has led to a total apathy towards malaria eradication programme.

5. The training status of most zonal/district level health personnel in malaria is very poor. Those trained need immediate retraining.

6. There is total absence of IEC component in the present malaria eradication programme.

7. Intersectoral coordination among different sectors of various departments directly concerned with malaria eradication programme is totally lacking.

8. States have failed to match central allocation on 50:50 basis, due to low priority to malaria problem, and lack of resources.

9. Very little attention has been given to the study of entomological factors in relation to the ecological changes which have modified the dynamics of disease transmission, particularly in urban and many rural areas.

10. The accountability of the MPWs by way of enforcement of time, place, movement schedule & its implementation in the periphery has not been enforced in most areas under NMEP.

11. Residual insecticide spray operations have by and large suffered due to poor planning and supervision, inadequate and late supply of funds, insecticides and equipments and poor acceptability by the people.

12. Monitoring of population movement during developmental activities, congregations during fares, etc. is totally lacking at the periphery.

13. There is no system of detailed analysis of epidemiological/entomological data generated at the periphery, either at district/state or central levels of national malaria eradication programme, which is clearly evident from the annual reports of the NMEP.

14. Monitoring of drug resistance, by P.falciparum monitoring teams working under central NMEP, is highly inadequate. The states do not have any infrastructure or expertise to monitor drug resistance. There is total lack of coordination between the central monitoring teams and the state health departments.

15. The process of generating epidemiological data by peripheral workers under NMEP seems to have lost its technical relevance with respect to modification in strategies for disease control/intervention of transmission, due to lack of critical analysis of the data either at the dist/state or central level of organisations. The states totally depend upon the centre for all technical guidance, but even the central NMEP lacks adequate capability for analytical epidemiology.

16. Epidemics of malaria are never forecasted either by peripheral or the State level health personnel/NMEP/MRC, due to lack of appropriate training and capability in analyses of epidemiological data at all levels.

17. The NMEP section of the Regional Offices for Health and Family Welfare (ROH&FW) situated in state capitals have also failed to provide analytical information on epidemiology, entomology and ecological aspects of malaria for urban and rural areas of the country.

18. Public health specialists as epidemiologists in these NMEP sections of ROH&FWs, particularly in the 7 states viz. Andhra Pradesh, Bihar, Gujarat, Orissa, Madhya Pradesh, Rajasthan, Uttar Pradesh are conspicuously absent, instead GDOs are posted in most of these places.

Revised Strategy for Malaria Control

1. Strong political will, which has already been demonstrated when India became a signatory to World declaration for malaria control (October 1992), in Amsterdam.

2. A shift from centralised national malaria eradication programme to decentralised malaria control planning and implementations.

3. Decentralised malaria control envisages district level microplanning, execution, monitoring and evaluation of malaria control activities.

4. Strengthening of institutions like CHC/PHC/Sub centres, by filling up of vacant positions as per national norms, as expeditiously as possible, to make all peripheral institutions fully functional.

5. Creation of district epidemiological cell with properly qualified and trained epidemiologist, entomologist and well equipped laboratory, biostatistician and mobile unit for field work. The cell should also be equipped with computer, connected to the national computer network, for transfer of information from periphery to state and central levels. For details refer to chapter 5.

6. The cell should take up short & long term studies in clinico-epidemiological, entomological and ecological features to study local situation and develop microplan of action for malaria control. These activities of the cell should be an ongoing process. The data generated should be utilised for computer analyses to develop predictive models to forecast malaria epidemics. Through the computer system, the cell should regularly monitor and periodically evaluate the impact of control activities in their districts.

7. The States should periodically organise seminars/meetings (atleast six monthly) for the dist. level health personnels for exchange of knowledge and ideas, and identify problem areas which require special attention of administration and/or research organisations.

8. The functions of dist. epidemiological cell should essentially be integrated with primary health care delivery system, wherein, at the periphery the cell should be able to actively participate in technical matters related to control of other diseases like T.B, Leprosy, Filariasis, J.E. etc.

9. For prompt diagnosis of malaria, laboratories should be strengthened by filling up vacancies of laboratory technicians, and provide a laboratory and a PHC at 20,000 populations in tribal areas and at 30,000 population in non tribal areas.

10. Children and pregnant women, particularly in tribal areas being vulnerable to P.falciparum malaria should be the focus of attention for prompt diagnosis and treatment by active surveillance in these malarious areas. In other areas, since the infrastructure for active surveillance exists, surveillance may continue in a modified manner depending upon local malaria situation. The modalities of surveillance mechanism to be determined by district epidemiologist. In urban areas since passive agencies like hospitals/clinics/ dispensaries, etc. can provide useful data on disease prevalence, these should be identified, supported and strengthened.

11. In hard core tribal areas a local malaria link worker be provided in each village under a mission mode on a fixed honorarium for a specific period who would assist in promotion of IEC, collection of blood smears, treatment, referral and other services/disease control activities. His services may be subsequently utilized for control activities of other diseases also, after brief training.

12. Accountability of worker and supervision needs to be reactivated by either making and signing stencils or signing a register, as a token of their visit, to be kept at an accessible place of a village functionary or head man.

13. Training of health personnel at state and district/PHC levels should be undertaken on priority by National Institutes. The training curriculum of the present malariology course needs major changes with emphasis on those aspects of epidemiology, parasitology and entomology which have direct application in field. Typical academic aspects on these subjects should be avoided. Courses should be short with field oriented training.

14. The national level training faculty should be linked to the district epidemiological cell for updating their knowledge on the intricacies and complexities of the changing pattern of diseases and the parameters of local importance. This will help the faculty to periodically review their training curriculum for timely modifications.

15. At the national level, erstwhile Malaria Institute of India, now called N.I.C.D., has been actively involved in the training of various categories of health personnels in malaria and other communicable diseases of national and international level for over 40 years. The Institute with a well established infrastructure under a separate 'Division of training and malariology', and support faculty in medical entomology and vector control, microbiology, epidemiology and in training and malariology should be fully supported for augmenting its training division with periodic reorientation of the trainers at international institutes. The Malaria Research Centre (ICMR) has been carrying out research on various aspects of malaria should also be identified as active partner in the training programmes. Their training faculty should be identified, depending upon the expertise, for involvement in the national/state/district level training programmes.

16. NICD being the nodal organisation for training, the training centres at regional/zonal levels should be developed by the States with the assistance of NICD so that a decentralised training curriculum be prepared by each State depending upon local needs. These training centres should be part of an overall training system for other communicable diseases too, in an integrated manner. For training purposes also intersectoral coordination and cooperation should be sought in order to have better linkages in disease control activities at the periphery. For developing training capabilities in States rich field experiences of V.C.R.C (ICMR), Pondicherry should also be fully utilised by their active participation in the training programmes.

17. The states should build up capabilities, with the assistance of present NMEP, for monitoring drug resistance in P.falciparum. A P.falciparum monitoring team could be placed at zonal level (one team for 3-4 districts) particularly in tribal areas to start with. This will help prompt detection, and action for resolution of drug resistant foci. The existing P.f monitoring teams in States working under central NMEP should be actively involved in building up technical skill/capability in the States on priority basis. These teams may eventually merge with the State's Health Department at appropriate level. These activities should be fully supported for the smooth running of malaria control activities.

18. Certain areas in the country, particularly tribal population show a considerable degree of genetic variation in the red cell polymorphism, which are known to be linked to resistance against clinical malaria. Antimalarial drugs such as 8-aminoquinolines are known to have harmful effect on such individuals (details of the distribution of these defects in India are annexed; Page 32-43). Use of drugs in these populations should therefore be monitored for its adverse effects on genetic variants. This work should also be entrusted to district epidemiological cell.

19. The logistics e.g. replacement of old vehicles, timely supply of drugs, equipments, etc. require special attention of state governments by periodic reviews/meetings, preferably six monthly.

20. Depending upon the microplan at district level, bio-environmental control of malaria vectors should find appropriate place in the control strategy. The use of chemical insecticide should be very selective depending upon local epidemiology, vector behaviour and other associated parameters.

21. An integrated approach to disease vector control with main thrust on bio-environmental control measures (biocides, environmental management and manipulation) should be given high priority. Vector control by residual insecticides, though, has been successful, but the available evidence now demonstrates major set backs in vector control due to behavioural and physiological resistance to insecticides among mosquitoes. Endophilic mosquitoes have become exophilic due to insecticidal selection pressure in many areas. Therefore, vector control strategies appropriate to local conditions should be developed. Methods like personal protection by impregnated bed nets, curtains, etc. at places where feeding and resting behaviour of vectors would permit a successful intervention of malaria transmission, should be advocated. Stock (though limited) of chemical insecticides including residual as well as space sprays should be available with district epidemiological cell/district malaria officer for use during outbreaks, particularly in non-tribal epidemic prone areas of the country.

22. Budgetary provisions for other disease control programmes like TB, Leprosy, AIDS etc. have indicated expenditures on items like IEC, MIS, Training, equipment etc. These may be pooled together along with malaria for common benefit of the community.

23. The M.Sc (Medical entomology) course conducted at V.C.R.C., Pondicherry should be strongly supported and these medical entomologists, a product of this centre should find place in the district epidemiological cell as district entomologist. The number of candidates admitted for the course each year should be doubled to increase the output.

24. Drug policy to be periodically reviewed by the present NMEP, Delhi based upon information generated by (i) district epidemiological cell and (ii) the zonal level P.falciparum monitoring team.

25. Modalities of implementing above recommendations to be worked out by the States and the Centre after the proposed preparatory phase microplan for tribal areas is finalised (as per details in interim report of the task force).

26. A malaria bulletin, preferably quarterly, should be published by each State to highlight important events related to malaria control, district wise or zone wise.

27. The NMEP section of the Government of India's Regional Office of Health and Family Welfare (ROH&FW) in each state capital should be fully utilised by the State Governnments in the development of district microplan. The medical officers and entomologists in ROH&FW should essentially be trained at NICD for development of microplans. The malaria microscopy training for technicians, being carried out at ROH&FWs, should be done more regularly. The malaria clinics run by these offices in each state collect very useful data on malaria epidemiology of urban areas, but since none of these data are analysed either by epidemiologist of ROH&FW or by the NMEP headquarters at Delhi, there is urgent need to train these regional epidemiologists/SMO, in ROH&FW in analytical epidemiology so that magnitude of urban malaria problems can be adequately understood. The district epidemiological cell of the district covering these urban areas should work in close collaboration with the ROH&FW to develop microplan for the district. The ROH&FW officers should be fully involved in all malaria control activities of the state depending upon the local needs as projected by the State.

28. The epidemiologists in the NMEP section of ROH&FWs, particularly in the 7 states viz. Andhra Pradesh, Bihar, Orissa, Madhya Pradesh, Rajasthan, Gujarat and Maharashtra should essentially be a Public health specialist rather than a GDMO.

29. The field survey units of Central Bureau of Health Intelligence (CBHI) should be actively involved in field operational research on malaria/communicable and provide feed back to district epidemiological cells of the respective states. These units should work in close collaboration with the state governments, as they can provide useful input to the MIS at dist./state and central levels. The headquarters of CBHI in Delhi should periodically evaluate the functioning of their field units, for timely modification of survey methodologies depending upon local needs.

30. In the tribal areas, areas covered under MADA and north eastern states, 100% funding should be from the centre. The other areas may continue to be under 50:50 sharing basis.

31. Cost analysis, cost effective and cost benefit studies of malaria control activities should be taken up periodically for ensuring optimum utilisation of resources alongwith various cost containment activities including possibility of cost retrieval.

32. Resource allocation to malaria control programme should be need based ensuring that control technology will be most cost effective at various levels.

33. A relevant monitoring and evaluation mechanism needs to be evolved for the malaria control activities, however, the mechanism must become an integral part of the national health management information system.

34. Training for malaria is important, however for ground level worker for the implementation of malaria programme, training should be holistically built into total health, manpower planning and development programme.

35. Out of the total budget for malaria control 6.0% be allocated to IEC & MIS, 3% for manpower development and 3% for research.

36. Disease Management : Disease Management has to be a priority intervention for control of malaria because it represents the most direct and feasible approach to reducing malaria morbidity and mortality.

Correct disease management is a complex process. Health providers must make a correct diagnosis; provide treatment in accordance with national guidelines; educate patients about compliance with treatment regimens; and practice appropriate referral when necessary. In order to achieve these performance levels, facilities must have appropriate diagnostic and referral procedures; adequate supplies and equipment; access to a laboratory for slide confirmation if needed; and standard guidelines and drugsa for the management of disease. In addition to these resources, adequate clinic management is needed and should be incorporated into national evaluation plans.

Similarly, appropriate disease management in the home requires that patients or caretakers correctly recognize dangerous symptoms; take recommended action in initiating home treatment or seeking health services; and comply with the treatment regimen prescribed. Appropriate home management of disease therefore requires access to antimalarial drugs.

Basic Principles of Correct Case Management : Correct case management is the main element of a national malaria control programme. This element has to be made available and the following principles will determine its availability.

Development of National Malaria Policy : Programme managers should be encouraged to develop a malaria disease management policy which would be prepared by the technical uinit, discussed within the Ministry of Health, and adopted through a national consensus through a national meeting involving care providers, drug providers, IEC specialists, and everyone who has a role in making the programme work more effectively. The document should cover both disease management, personal protection and disease prevention. The disease management section should define the role of health services, mothers, and the informal sector, establish criteria for diagnosis and the role of diagnostic tools including the role of microscopy, define who are providers, establish and review treatment algorithms and outline malaria drug policy, specify the structure of the referral system, etc. It should also define what services will be provided at what levels of the health services, given the resource base, i.e. drugs, personnel, finances, etc. according to the type of malaria.

National malaria therapy guidelines define for the health services recommended strategies for the recognition and diagnosis, therapy, and the management of severe and complicated malaria cases.

37. Malaria disease recognition and diagnosis : The national policy should define the criteria for the diagnosis of malaria illness at the various levels of the health system. As noted, the management of malaria illness based on findings from the clinical history and signs and symptoms at presentation is not only an acceptable basis for the management, but can produce effective and standardized medical care. The criteria for dispensing malaria therapy in health facilities can be highly inaccurate and variable and need to be standardized to a national policy based on the local epidemiology of Plasmodium-assiciated disease.

In all malaria-endemic areas, clinical criteria for managing acute malaria febrile illness are required. The definition of diagnostic criteria for febrile illness should be developed in an integrated format to cover broadly those diseases that can manifest with fever in defined age groups. Recently developed case management algorithms for febrile illness in children provide a valuable model for the logical integration of malaria management with other disease management programmes in the health services.

In areas where P.falciparum is transmitted, two other disease processes require defintion. Persistent parasitemia in young children and pregnant women has not been addressed as a disease condition unless it is associated with fever. Nevertheless, it is increasingly recognised that persistent infection may produce substantial disease even if it occures without fever. Anemia in children and pregantn women is a prominent component of malaria and the health system must be capable of recognising the condition. Clinical criteria for the definition of anemia have proven to be difficult to standardize, except in severe and life-threatening cases, and laboratory support .s generally required.

National malaria therapy guidelines will define the requirements for laboratory diagnostic capabilities. As noted, malaria programmes have historically viewed the parasitologic diagnosis of Plasmodium infection as manadatory, yet, such laboratory confirmation is not possible, despite the

desire to have laboratory support for medical care. Its valueis especially low in a highly endemic malarious area where most children will be found to have parasites. Nevertheless, laboratory diagnosis isundeniably required for malaria management particularly in tribal and north eastern areas where the Plasmodium diagnosis carries distrint drug therapy recommendations and in areas of P.falciparum transmission where the severly ill patient may have malaria. Placing laboratory capacity in secondary and tertiary medical facilities, while cost efficient, may fail to address the need for laboratory services at theperiphery of the health care system. Where blood slides are still an important feature of malaria diagnosis, malaria can be a driving force for the improvement of lab services which would also be useful for tuberculosis and other diseases. It is essential to have a system for quality control in any laboratory system; there is a need a referral laboratory to monitor the quality of field activities. Lack of laboratory confirmation should never be a reason for delay in beginning treatment for malaria.

38. Indoor residual spraying : From a technical point of view, house spraying with long-lasting insecticide has been effective under many environmental conditions when targetted against strongly anthropophilic endephilic species. On the other hand, house spraying will be ineffective against exophilic species. The efficacy of residual insecticides may also vary according to housing structure (sprayable surfaces, properly constucted walls, mud/stick walls, thatch). In addition to these technical factors, house spraying is also affected by social factors such as the motivation of the population which is very often reduced after some years of regular spraying. House spraying remains particularly useful and effective in epidemics, provided it can be applied at the right time when conditions for efficacy of this measure are present.

House spraying and space spraying require skilled managers, reliable equipment, well-trained sprayers and strong financial support. Therefore, the choice of these methods has to be made with great care according to exact actual and foreseen needs.

House spraying with residual insecticides remains the most widespread method of vector control formalaria, it is enormously resource consuming, and often not very effective.

It is useful to distingulsh three main problem areas:

- To define indications for what one could consider new applications;
- Where to stop spraying that is still ongoing, or rather progressively diminish the use of except where it is clearly compIketely ineffective because mosquitos are outdoor resting or totally resistant;
- Where to maintain it, and for how long.

In this, it has to be considered that where spraying is still acceptable and seen as useful by the population, one cannot suddenly take away from people what they are presently getting free from the government. Changes have to be carefully planned.

In decisions on where to apply and not to apply, there is a need for entomological competence, and this competence should be shared with other programmes like dengue, leishmaniasis, and other vector borne diseases. It is also important to ensure coordination with agriculture.

In particular where spraying has already been applied for a long time, the assessment of epidemiological impact is often very difficult, because of the inevitable confounding of many other factors.

The following approaches to this problem should be considered. The distribution and trends in malaria should be comnpared with the quality and coverage of the spraying. If a large region has been sprayed, and if there is then little association between the absence of malaria and good quality spraying with high coverage, the effect of spraying may have had very little to do with malaria.

On the other hand, if malaria persists in the presence of very bad spraying, and it has proven impossible to fulfill the basic requirements, the spraying should rather be stopped.

39. Under the MPO a criterion for spraying based on annual parasite incidence (API) is still considered as the basis for decision-making, although API may have little relation to the actual burden of malaria, and there is far from enough insecticide to make this feasible. The inability to get enough coverage should lead to a profound revision of criteria, leading to far more restricted spraying.

In some parts of India, it is expected that impregnated nets will gradually replace spraying; careful controlled trials of impregnated nets are long overdue in areas where large scale spraying is still carried out.

40. Larval control : Larval control by source reduction can be done only in restricted places or where breeding sites are scarce, well known and defined. Larval control measures could be envisaged in urban situations where mosquitoes breed in stagnant water and breeding sites are relatively scarce due to pollution.

Some source reduction can also be done at village level, with primary health workers coordinating community based activities such as the filling of borrow-pits and abandoned wells and cesspools; however in many situations the epidemiological impact from such measures is uncertain.

Large-scale source reduction (e.g. drains) can be done only by large or specialised teams, mainly in the framework of land reclamation, agricultural programmes, or road building.

Agricultural projects such as rice culture could result in increased malaria transmission and morbidity in arid areas. But in many parts of the world, rice cultivation actually does not increase transmission and malaria morbidity due to many factors including increase of financial input and better health care.

The use of fish for larval mosquito control is well knwon (WHO 1989) and has been successfully used where breeding sites are well knwon, and restricted in time and space. However, they are unsuitable for controlling species which breed in small and temporary breeding sites (pools, puddles).

The use of larvicides, chemical or biological, involves regular treatment of breeding sites and careful inspection at least once a wekk. This requires organization, supervision, and permanent stocks of suitable insecticide and sprayers which can be met only in some special situations.

41. Personal protection measures : A wide variety of methods are available for personal protection; at present, very much attention is giving to mosquito nets impregnated with long acting synthetic pyrethroids which have proven their efficacy for reduction of morbidity and mortality in some situations. More research on them are underway. Other barrier methods exit, but there is limited information on their effectiveness, and few of them are likely to have such broad applicability as impregnated nets. There is a broad scope for development of such methods in accordance with local habits.

Impregnated nets is an appropriate technology for individual, family and community protection. However, the efficacy will be reduced where the mosquito species are primarily exophagic, or when people stay outside during the evening. Treated mosqicto nets will be more effective when used on a large scale by reducing the inoculation rate.

It is important to distinguish between promotion of the use of impregnated mosquito nets through public education, and the application of them as an intervention aiming at a certain level of coverage of a given population funded fully or partially by public funds. In the latter case, it is important that the efficacy under local conditions has been documented and that sustainability can be ensured.

One of the reasons for the generally very good acceptability of impregnated nets is the fact that they reduce the nuisance from a variety of arthropods.

Basically, impregnation of bednets is a straight-forward, simple procedure. It requires simply some water, a plastic pan, gloves, and a small amount of insecticide. With short training, impregnation of bednets can be done by almost everyone and can be carried out at village level.

Where people already use bednets, insecticide treated bednet programmes can be implemented relatively easily. In such cases their impregnation can be done following a good promotional campaign, and reimpregnation could be expected according to the efficacy with which the bednets reduce not only the anopheles population but other biting and disturbing arthropods (bed bugs, ticks, lice, cockroaches). This on the other hand makes it a concern whether in the long term, bedbugs, lice etc. may develop resistance to the class of pyrethroid insecticides in use.

Large-scale use of insecticide treated bednets will be more difficult to implement where people do not already use bednets for financial and cultural reasons. Provision of nets at a reasonable price and targeted health education may motivate such populations to accept a programme or start acquiring nets themselves for self protection.

Environmental control has a high cost of investment, but low cost of maintenance; however, this cost has to be appreciated in the planning, otherwise a situation may become worse than before because of stagnant water in canals. The benefits of land reclamation are diverse; the recovery of fertile land is usually more important than reduction in malaria. However, ecological considerations impose some limitations on land reclamation. Also, the environmental and entomological factors should be carefully assessed, before the claim that a certain drainage project will reduce malaria is accepted.

A policy of preventing manmade malaria and good engineering practices has been neglected since DDT cam about. General physical planning should go hand in hand with social and economic development. This alone will be sufficient for prebventing malaria in many areas.

In areas where malaria is associated with frontier areas of economic development such as the tribal areas there is now increasing recognition of the principle of sustainable development. This opportunity should be seized by promoting malaria control; as part of social and ecological stabilization of the newly colonized areas for the populations which have already settled, while further infringement on the forest environment is prevented.

42. Chemoprophylaxis : Chemoprophylaxis cannot today be considered on a par with other methods of prevention;I the problems of drug resistance are steadily increasing limiting the choice of drugs available for chemoprophylaxis; and long term coverage of large groups by drug prophylaxis may accelerate the development of resistance.

Prophylaxis is today desirable for pregnant women living in areas where the transmission is very intense leading to parasitaemia causing low birth weight and anaemia or to a high risk of life threatening malaria attacks. However, the choice of safe drugs is becoming increasingly difficult, and it may be necessary to prompt radical treatment or repeated suppressive treatment. While the choice of strategy should be guided by the malaria control programme, its implementation is normally part of antenatal care.

Chemoprophylaxis is used by tourists and may in a similar way be used as a short term measure for work soldiers, police and labour forces. For the latter, ,prophylaxis should as soon as possible be replaced by personal protectionmor vector control.

43. Implementation : Activities which will provide the basis for planning of further development or rural health infrastructure for malaria control.

44. Emergencies/Management of Epidemics : In considering the suitability of existing services to detect (or predict) and control epidemics, it is necessary to determine who has the capacity to judge the abormality of situation and to call attention to it and, where this capacity exists, who is able to respond to reports of abnormal situations with apporpriate studies and control interventions, and who has the authority to organise the required response and to mobilise the necessary human, material and financial resource.

Health services should encourage the recognition and reporting of abnormal situations, such as excessive numbers of cases of fever or premature consuption of existing stocks of antimalarial drugs, and the community health workers and peripheral health services should report their findings to the appropriate epidemiological services. The latter should have the capacity to respond by implementing appropriate control interventions based on a rapid evaluation of the situation.

Thus community health workers who have the closest contact with communities, have an important role to play in monitoring unusual circumtances and in reporting them promptly to the health officials responsible. At each level of the health care system monitoring will vary. In some areas selected hospitals and health insitutions have been used as sentinel posts for assessing changes in numbers of malaria deaths and in

the number of cases of severe and non severe malaria. If selected carefully, especially in relation to high risk strata, they can provide valuable information on which the epidemiological services can act.

It is the role of the epidemiological services constantly to analyse and interpret the information on communicable diseases arriving from the periphery. They should notify those responsible in the general heealth services and, the malaria control specialists should evaluate the situation and guide the health services on the most appropriate action to be taken, and on when and where it should be taken.

5. In view of the recommendations made in this revised strategy for malaria control, there is an urgent need to prepare a manual on malaria control.

MALARIA AND THE RED CELL GENETIC DEFECTS WITH SPECIAL REFERENCE TO INDIA AND THE TRIBAL AREAS

The genes for red cell defects have been extensively studied in different populations all over the world. The remarkably high gene frequencies for the common red cell polymorphisms have particularly evoked great deal of interest in the field of human population genetics. The geographical distribution of these genetically variant red cells (G-6PD deficiency, sickle cell anemia, duffy blood group) provided evidence that one of the major factors involved in maintaining these polymorphisms was resistance to malaria.

The overall world distribution of the G-6PD deficiency, common Hb variants (sickled cells) and thalassemia tends to parallel the frequency of malaria. The incidence of G-6PD deficiency and HbS (sickled cells) have been found to correlate well with the intensity of malaria endemicity.

G-6PD Deficiency

The enzyme G-6PD is one of the most polymorphic proteins known, with an estimated 400 million people throughout the world being deficient in G-6PD. This is because heterozygotes have a selective advantage in malaria infections. It is widely accepted that this high frequency has evolved because of the selective pressure exerted by P.falciparum malaria. This is evident from the fact that G-6PD deficiency in the world correlates unambiguously with that of past and present malaria endemicity. The epidemiological evidence is strengthened by the fact that different mutant alleles are responsible for G-6PD deficiency in different parts of the world.

Sickle Cell Anemia

Sickle cell anemia (HbS), a structural defect of hemoglobin (substitution of glutamic acid to valine at the sixth position of the B-globin chain) is the most widespread hemoglobin variant in India with an incidence of about 1%. HbS is fatal in homozygotes (HbS) whereas heterozygous individuals (HbA HbS) are silent carriers of the defect. The HbS gene has been reported to confer protection from P.falciparum infection. HbC and HbE are relatively harmless in the homozygous state, but can produce major hemoglobinopathies when combined with HbS (mainly HbS/C disease) or B thalassemia (HbS/B thalassemia, HbE/B thalassemia). HbS is thus the constant factor in the major structural hemoglobinopathies. HbE, a B globin chain mutant is, common in S-E Asia and eastern parts of India.

Duffy Antigen

Besides the red cell genetic defects, studies on the mutation in RBC surface antigen, viz. Duffy blood group, have provided interesting clues to the resistance towards vivax malaria. It is known that Duffy negative (Fy/Fy) individuals are totally resistant to vivax malaria.

Protection afforded against malaria

By G-6PD Deficiency

The maintenance of the existing polymorphism at the G-6PD locus and its role in the incidence of malaria has received world wide attention. There is impressive evidence from population and experimental studies that genetically determined deficiency of G-6PD confers relative protection against the human malaria parasite, P.falciparum. The protection phenomenon is manifested in heterozygous females who are genetic mosaics but surprisingly not in hemizygous males with complete deficiency.

Clinical Manifestation

Individuals with G-6PD deficiency remain undetected unless subjected to some sort of stress, like favism, antimalarial drugs and infections, thereby making their erythrocytes undergo acute hemolysis, resulting in hemolytic anemia. Drug induced hemolytic anemia, the clinical manifestation of G-6PD deficiency, is one of the important consequences of severe enzyme deficiency. Excessive hemolysis would result in hyperbilirubinemia which would cause brain damage due to kernicterus.

By Sickle cell anemia

The HbS allele represents selective adaptation to P.falciparum. Heterozygote sicklers are less susceptible than others, to malarial infection and its effects. It has been reported that parasitization predisposes HbAS cells to sickle by decreasing the intracellular pH and deoxygenating hemoglobin.

By Thalassemia

In vitro studies of parasite invasion and growth in thalassemic cells have failed to show any convincing evidence that these cells are more resistant to malarial infection. It has been found that cells containing relatively large amounts of HbF (in thalassemics) tend to show a reduced rate of parasite growth. The red cell membrane in heterozygous thalassemia is particularly sensitive to damage by oxidation and that infection with the malarial parasite may produce sufficient oxidative stress to alter intracellular metabolism in the way that might lead to the premature death of the parasite.

By the Duffy Antigen

The demonstration that Duffy negative red cells were resistant to invasion by P.knowlesi, a parasite of macaques, led to further studies on human parasites and the apparently complete resistance of Duffy negative individuals to vivax malaria. Several studies in countries with endemic malaria have also shown that Duffy negative individuals are totally resistant to vivax malaria. On the other hand the Duffy negative blood group allele which leads to an almost complete resistance to vivax malaria, is found in highest frequencies where there is no vivax malaria. This total resistance of Duffy negatives to vivax malaria is now the most striking of any association between a genetic trait and an infectious disease.

Effect of Antimalarials on Red Cell Variants

Primaquine (8-aminoquinoline) is a toxic drug and a range of toxic side effects are known to occur even in normal individuals after the administration of Primaquine and its 8-aminoquinoline predecessors. These side effects may include gastrointestinal effects (abdominal pain or cramps, anorexia, nausea and vomiting if the drug is taken empty stomach), granulocytopenia (produced when sulphonamides are used concomitantly with primaquine), lymphocyte proliferation (possibility of immunosuppressive activity by use of primaquine), development of methemoglobin (which may result into cyanosis when methemoglobin concentration exceeds 15-20 gm/litre of blood).

On G-6PD

Some antimalarials like Chloroquine and Primaquine are known to have adverse effects on individuals deficient in G-6PD. When G-6PD deficiency individuals are administered antimalarial drugs they undergo acute hemolysis. Very high concentration of primaquine produces potassium loss and eventually lysis of G-6PD deficient cells. It can be assumed that the administration of drugs inflicts a lesion on these cells that permits them to be selected for destruction by the reticuloendothelial system. The most easily measured of these changes are the loss of reduced glutathione and the formation of Heinz bodies.

The blood platelets and leukocytes accumulate large amounts of chloroquine and excessive thrombocytosis or leukocytosis could, therefore, alter the normal distribution of the drug in blood.

Distribution of the red cell genetic defects in India

The polymorphisms of the hemoglobin loci, including thalassemia and the G-6PD deficiency have generally been assumed to be due to selection by malarial parasite. These have been extensively studied in the diverse population groups of India. However, the tribal groups consistuting 8% of the total Indian population (census 1981) are found in almost all states and union territories of India and have not been fully screened with respect to these polymorphic genetic markers.

The geographical distribution of the red cell genetic defects in India is presented in tables 1-5 and shown in maps 1 and 2.

G-6PD

The prevalence of G-6PD deficiency in India varies from 0 to 27% in the different tribal groups (Table I). There is no specific pattern of distribution in the diverse population groups of India. In general G-6PD deficiency has been found to be more frequent in tribes than in non-tribes. The incidence has been found to be high among tribals inhabiting the malaria endemic regions. However, a high degree of variation in the incidence of G-6PD deficiency has been observed in the tribes of the north-eastern region.

HbS (sickle cell)

The overall frequency of HbS is shown to be 1% in India. Both, Sickle cell anemia and sickle cell trait occur in high frequencies in the endogamous populations of India. Particularly high incidence has been observed amongst the tribal groups (Table 2).

Hb E

A high frequency of HbE has been reported in the eastern region of India (Table 3). In Assam HbAE ranges from 27.48% in Mikirs to 49.73% in the Kachari tribe. The Garo and Ahom tribes show a frequency of 37.04% and 46.51% respectively. The homozygous HbE ranges from 6.11% in Mikirs to 31.11% amongst Garos. In Tripura HbE has been reported to be absent in the Riang tribe. In Khasis of Meghalaya the HbAE frequency has been reported to be 41.3%.

B-Thalassemia

There is paucity of information regarding the incidence of B thalassemia in the tribal populations of India (Table 4). The B thalassemia trait has been studied in three tribes of Madhya Pradesh (Bhils, Bhilala and Patelia) and the Bhils of Rajasthan.

The Duffy Antigen

A complete absence of Duffy negative blood group has been reported in the tribal populations studied so far (Table 5). The Ao Nagas of Nagaland, Talavia Dubla tribe of Maharashtra and Ho, Santhals, Desi Bhumij, tribes of Bihar have all shown the absence of Duffy antigen.

Table 1: Distribution of G-6PD deficiency in the tribals of India

Tribe	Place	N(♂)	Deficients No.	Deficients %	Ref No.
Assam					
1. Ahom	Dibrugarh	130	7	5.40	17
2. Garo	Kamrup	76	6	7.89	15
3. Rabha	Kamrup	57	9	15.79	15
4. Mikir	Kamrup	83	13	15.66	15
5. Lalung	Nowgong	81	3	3.70	15
6. Tea garden tribals(Bokal, Barbuah, Dikom, Mattack, Nudwa and Sinlijan)	Dibrugarh	159	10	6.30	4
Meghalaya					
1. Khasi	Nongpol & Umsing	100	7	7.0	17
Nagaland					
1. Angami Nagas	Kohima	85	23	27.06	63
		65(♀)	10	15.39	
2. Ao Nagas	Mokokchang	324	47	14.43	71
Andhra Pradesh					
1. Koya Dora	Warangal	365	13	3.56	22
2. Naikpod	Adilabad	86	1	1.16	22
3. Rajgond	Adilabad	197	10	5.08	22
4. Lambada	Warangal	154	2	1.30	22
5. Lambada	Hyderabad	58	2	0.03	59
6. Koya Dora	W. Godavari	115	15	13.0	45
7. Pardhan	Adilabad	101	0	0	22
8. Kuruvikkaran	Nellore	96	4	4.17	58
Maharashtra					
1. Gond	Nagpur	104	11	10.58	35
2. Katkari	Kolaba	77	6	7.80	33
3. Bhil	Dhulia	215	16	7.44	33
4. Pawara	Dhulia	87	3	3.45	33
5. Koli	Thana & Kolaba	162	4	2.47	26
6. Korku	Amravati	525	82	15.62	69

Madhya Pradesh					
1. Bhil	Jhabua	120	8	6.70	54
2. Gond	Raipur	252	38	15.08	27
3. Kawar	Surguja	137	22	16.03	27
4. Oraon	Surguja	411	55	13.38	27
5. Gond	Surguja	169	22	13.02	27
6. Kawar	Raipur	115	9	7.83	27
7. Bhil	Jhabua	733	36	4.91	27
8. Bhilaba	Jhabua	289	17	5.88	27
9. Patelia	Jhabua	153	4	2.61	27
Orissa					
1. Bhuyan)	Banspal of	102	15	14.70	10
2. Juanga)	Keonjhar	53	7	13.20	10
3. Munda)	district	52	6	11.53	10
Rajasthan					
1. Bhil	Udaipur	104	17	16.30	29

Table 2 : Frequency of Sickle cell hemoglobin HbS.

Tribe	Place	N	Phenotype(%)			Ref No.
			AA	AS	SS	
Andhra Pradesh						
1. Yanadi	Nellore	187	100	0	0	51
2. Konda Reddy	E. Godavari	129	97.67	2.33	0	51
3. Valmiki	E.Godavari	99	79.79	20.20	0	51
4. Yerukula	Nellore	38	100	0	0	51
5. Yerukula	Anantapur	20	100	0	0	51
6. Sugali	Kurnool	7	85.72	14.28	0	51
7. Chenchu	Kurnool	154	100	0	0	51
8. Sugali	Anantapur	110	97.27	2.73	0	51
9. Koya Dora	East Godavari	112	91.96	8.04	0	51
10. Koya	Khamman	70	98.57	1.43	0	51
11. Koya	Khamman	123	92.68	7.32	0	51
12. Koya Kammara	East Godavari	59	83.05	16.95	0	51
13. Yerukula	Warangal city	125	99.20	0.80	0	23
14. Savara	Srikakulum	132	98.48	1.52	0	44
15. Jatapur	Srikakulum	157	98.73	1.27	0	44
16. Sugali	Mehbubnagar	61	95.08	4.92	0	9
17. Yerukula	Mehbubnagar	40	100	0	0	9
18. Konda Reddy	Khamman	92	97.83	2.17	0	9
19. Koya	Khamman	159	86.79	12.58	0.63	9
20. Rajgond	Adilabad	133	84.96	14.28	0.75	9
21. Pardhan	Adilabad	101	64.35	34.65	0.99	9
22. Koya Dora	Godavari	99	75.76	24.24	0	70
23. Koya Dora	Warangal	547	92.14	7.86	0	24
24. Naikpod	Adilabad	90	95.39	4.61	0	24
25. Lambadi	Warangal	154	97.36	2.64	0	24
26. Pardhan	Adilabad	122	68.29	31.71	0	24
27. Rajgond	Adilabad	197	88.66	11.34	0	24
28. Kolam	Adilabad	215	85.12	14.42	0.46	56
29. Chenchu	Mehbubnagar	139	99.28	0.72	0	57
Bihar						
1. Munda	Ranchi	105	100	0	0	39
2. Desi Bhumij	Singhaum	168	99.40	0.60	0	40
3. Khairwar	Palamau	67	100	0	0	38
4. Chero	Palamau	57	100	0	0	38
5. Bhuiya	Palamau	41	100	0	0	38
6. Santhal	Santhal Parganas	126	100	0	0	7
7. Ho	Singhaum	200	99.50	0.50	0	41
8. Oraon	Ranchi	100	100	0	0	
9. Dudh Kharia	Ranchi	119	100	0	0	8

10.	Saura Paharia	Santhal Parganas	126	100	0	0	51

Gujarat

1.	Naik	Surat	174	83.91	16.09	0	75
2.	Naik	Bulsar	12	75.0	25.0	0	51
3.	Bhil	Panchmahal	200	86.50	13.50	0	51
4.	Bhil	Panchmahal	206	84.47	15.53	0	75
5.	Bhil	Kutch	32	100	0	0	51
6.	Bhil	Surat	19	73.68	26.32	0	52
7.	Gamit	Surat	136	75.0	25.0	0	52
8.	Gamit	Surat	207	68.60	31.40	0	75
9.	Bhil	Broach	215	79.43	20.47	0	75
10.	Koli	Junagarh	78	98.72	1.28	0	51
11.	Dudhara	Surat	115	73.91	26.09	0	52
12.	Dhodia	Bulsar	109	86.24	13.76	0	52
13.	Konka	Bulsar	58	91.38	8.62	0	51
14.	Worli	Bulsar	23	86.96	13.04	0	52
15.	Koli	Bulsar	182	95.61	4.39	0	75
16.	Dubla	Bulsar	211	90.52	9.48	0	75
17.	Konkana	Bulsar	128	92.19	7.81	0	51

Madhya Pradesh

1.	Bhil	Indore	46	76.09	23.91	0	37
2.	Bhil	Sailana Taluka	84	94.10	5.90	0	36
3.	Bhil	Badnawar, Bagh	44	88.60	11.36	0	37
4.	Bhilala	Rural area	139	71.95	28.05	0	37
5.	Dhurwa	Bastar	348	96.55	3.45	0	51
6.	Hill Maria	Bastar	85	80.0	20.0	0	51
7.	Bison horn Maria	Bastar	442	81.45	18.55	0	51
8.	Manjole Bhatra	Bastar	64	89.06	10.94	0	51
9.	Muria	Bastar	169	84.02	15.98	0	51
10.	San Bhatra	Bastar	88	80.68	17.32	0	51
11.	Rajgond	Bastar	70	85.71	14.29	0	51
12.	Muria	Bastar	143	89.51	10.49	0	51
13.	Halba	Bastar	77	72.73	27.27	0	51
14.	Gond	Raipur	157	84.08	15.92	0	27
15.	Gond	Ambikapur	127	79.43	20.47	0	27
16.	Oraon	Ambikapur	422	97.81	2.90	0	27
17.	Kawar	Ambikapur	114	99.10	0.90	0	27
18.	Kanwar	Ambikapur	100	100	0	0	51
19.	Gonds	Bilaspur	129	80.62	19.38	0	50
20.	Bhil	Jhabua	105	92.38	7.62	0	3
21.	Bhilala	Jhabua	977	80.14	19.03	0.82	27
22.	Bhil	Jhabua	145	82.76	17.24	0	54
23.	Bhilala	Jhabua	384	68.49	31.51	1.82	27
24.	Bhilala	Jhabua	116	71.50	28.50	0	2
25.	Patelia	Jhabua	103	68.90	31.10	0	3

Maharashtra							
1.	Bhil	Dhulia	82	84.15	15.85	0	51
2.	Bhil	Aurangabad	102	98.04	1.96	0	51
3.	Bhil	Ahmadnagar	33	100	0	0	51
4.	Koli	Poona	181	99.45	0.55	0	51
5.	Katkari	Poona	61	100	0	0	51
6.	Katkari	Kolaba	109	94.50	5.50	0	51
7.	Katkari	Thana	70	98.57	1.43	0	51
8.	Dhor Koli	Thana	67	92.50	7.46	0	51
9.	Kokana	Thana	86	97.67	2.33	0	51
10.	Worli	Thana	145	93.10	6.90	0	51
11.	Mahadev Koli	Nasik	50	100	0	0	51
12.	Gono	Amravathy	29	82.76	17.24	0	51
13.	Korku	Amravathy	172	90.70	9.30	0	51
14.	Balai	Amravathy	11	54.54	45.45	0	51
15.	Pawara	Dhulia	110	75.45	24.55	0	51
16.	Bhil	Dhulia	186	91.40	8.60	0	33
17.	Pawara	Dhulia	122	77.87	22.13	0	33
18.	Katkari	Dhulia	131	93.89	6.11	0	33
19.	Pardhan	Nanded & Yavatmal	146	66.50	33.50	0	5
20.	Gond	Nanded & Yavatmal	257	93.40	6.60	0	5
21.	Bhil	Dhulia	673	81.43	18.57	0	5
22.	Kolam	Yavatmal	36	91.70	8.30	0	5
23.	Pawar	Jalgoan	219	82.20	17.80	0	5
24.	Tadvi	Jalgoan	72	91.70	8.30	0	5
25.	Vanjara	Jalgoan	413	94.40	5.60	0	5
26.	Andha	Nanded	152	98.10	1.90	0	5
27.	Mahadev	Thana & Poona	155	88.10	2.90	0	5
28.	Thakur	Ahmadnagar	358	100	0	0	5
29.	Koli	Thana & Poona Thana,Kolaba	309	99.19	0.16	0	26
30.	Korku	Melghat, Amravati	716	89.95	9.49	0.56	69
Orissa							
1.	Kondh	Koraput	100	100	0	0	1
2.	Ollaro Gadaba	Koraput	225	97.33	2.67	0	11
3.	Bada Gadaba	Koraput	99	100	0	0	11
4.	Konda Paroja	Koraput	225	100	0	0	11
5.	Santhal	Cuttack,Puri Balassore	51	100	0	0	60
6.	Pareng Gadaba	Koraput	225	87.56	12.44	0	11
7.	Bareng Paroja	Koraput	104	100	0	0	11
8.	Kondh	Kalahandi	116	88.79	11.21	0	24
9.	Nuka Dore	Koraput	111	90.91	9.09	0	1

Rajasthan

1.	Garasia	Udaipur	35	68.86	31.14	0	51
2.	Garasia	Sirohi	75	80.0	20.0	0	51
3.	Meena	Udaipur	56	100.0	0	0	51
4.	Bhil	Udaipur	280	95.72	4.28	0	28
5.	Gamit	Udaipur	75	85.33	14.67	0	51
6.	Gamit	Sirohi	58	96.55	3.45	0	51
7.	Bhil	Bamaswada	100	82.0	18.0	0	51
8.	Bhil	Bamaswada	176	89.20	10.80	0	51
9.	Bhil	Bamaswada	69	98.55	1.45	0	51
10.	Koli thakurda	Bamaswada	14	92.84	7.14	0	51
11.	Bhil	) Dungarpur,	208	94.30	12.0	0	29
12.	Mina	) Banaswara,	205	95.10	4.40	0.50	29
13.	Garasia	) Udaipur	181	98.90	1.10	0	29
14.	Damor	)	160	100.00	0	0	29
15.	Gameti	)	146	99.40	0.60	0	29
16.	Adivasi	)	115	96.50	3.50	0	29

Assam

1.	Tea garden tribals (Barbaruah, Bokel, Dikom, Mattack, Nudwa, Singlijan)	Dibrugarh	336	86.90	12.80	0.3	4

Table 3 : Frequency of HbE

Tribe	Place	N	Phenotype(%) AA	AE	AE	AT	Ref No.
Assam							
1. Kachari	Dibrugarh	555	24.14	49.73	26.12	0	13
2. Ahom	Dibrugarh	82	41.46	45.12	13.41	0	12
3. Ahom	Dibrugarh	129	40.31	46.51	11.62	1.55	13
4. Garo	Kamrup	135	31.85	37.04	31.11	0	14
5. Rabha	Kamrup	128	18.75	55.47	25.78	0	14
6. Kachari	Kamrup	131	21.37	47.33	31.30	0	14
7. Lalung	Nowgong	114	29.82	50.88	19.30	0	14
8. Mikir	Kamrup	131	66.41	27.48	6.11	0	14
Meghalaya							
1. Khasi	Nongpol & Umsing N.of Khasi hills	120	56.43	36.43	4.28	2.85	17
2. Khasi	Nongpol & Umsing N. of Khasi hills	80	58.75	41.30	2.50	0	12
Nagaland							
1. Ao Nagas	Mokokchang	324	77.61	20.31	2.08	0	71
Tripura							
1. Riang	Villages of Beloria, Udipur of Amarpur subdvision	51	100	0	0	0	42

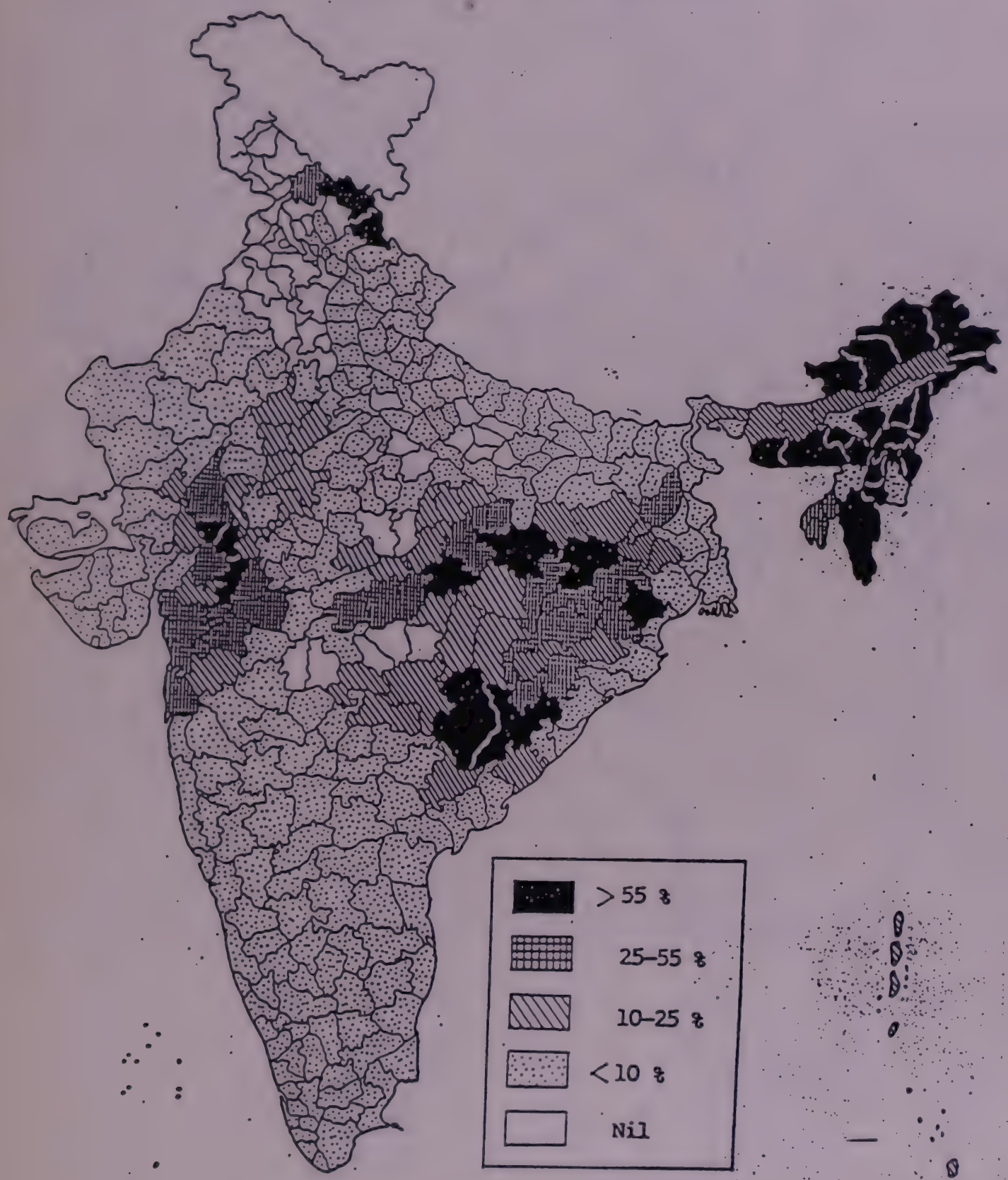
Table 4 : Frequency of β thalassemia

Tribe	Place	N	Raised		Ref No.
			No.	A_2(%)	
Madhya Pradesh					
1. Bhil	Jhabua	977	11	1.12	27
2. Bhilala	Jhabua	384	0	0	27
3. Patelia	Jhabua	164	0	0	27
Rajasthan					
1. Bhil	Udaipur	280	7	2.90	28

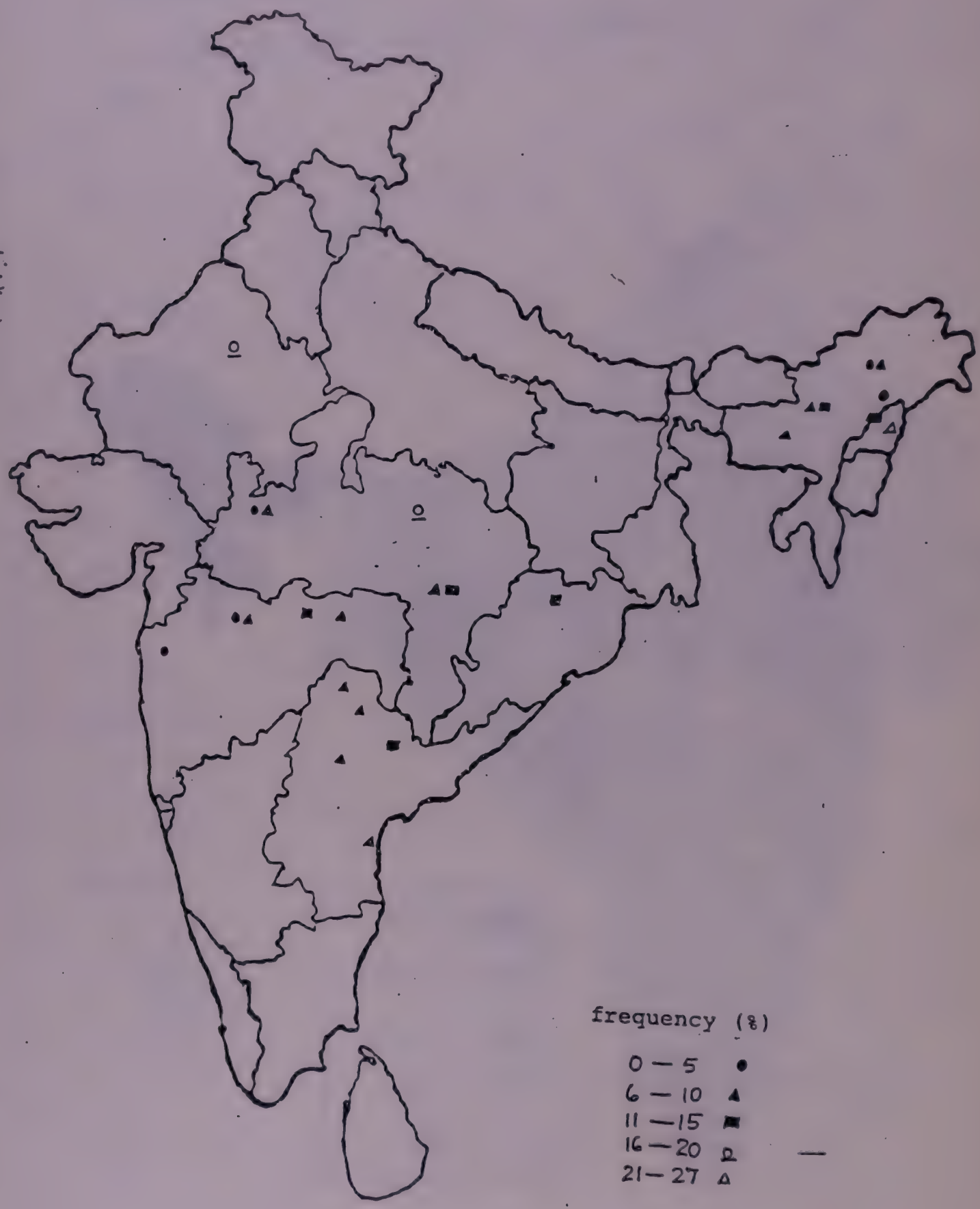
Table 5 : Distribution of the Duffy antigen

	Tribe	Place	N	Phenotype		Genotype		Ref No.
Bihar				Fy^{a+}	Fy^{a-}	Fy^{a}	$Fy^{b}+Fy$	
1.	Ho	Singbhum	74	58	16	0.535	0.464	43
2.	Santhal	Damin, Rajmahal, Santhal Parganas	100	80	20	0.553	0.447	7
3.	Desi Bhumij	Singbhum & Bahragora	75	19	56	0.136	0.864	40
Gujarat				Fy^{a+}	Fy^{a-}	Fy^{a}	$Fy^{b}+Fy$	
1.	Dhodia	Surat	89	58	31	0.41	0.59	75
2.	Dubla	Surat	198	129	69	0.41	0.59	75
3.	Koli	Surat	78	50	28	0.401	0.599	75
4.	Naika	Surat	82	50	27	0.426	0.574	74
Madhya Pradesh				Fy^{a+b-}	Fy^{a+b+}	Fy^{a-b+}	Fy^{a}	Fy^{b}
1.	Bhil	Jhabua	145	83	44	18	0.724	0.276	54
Maharashtra				Fy^{a+}	Fy^{a-}	Fy^{a}	$Fy^{a}+Fy$	
1.	Talavia Dubla	Bombay	198	130	68	0.414	0.586	74
Nagaland				Fy^{a+}	Fy/Fy			
1.	Ao Nagas		384	0	0			34

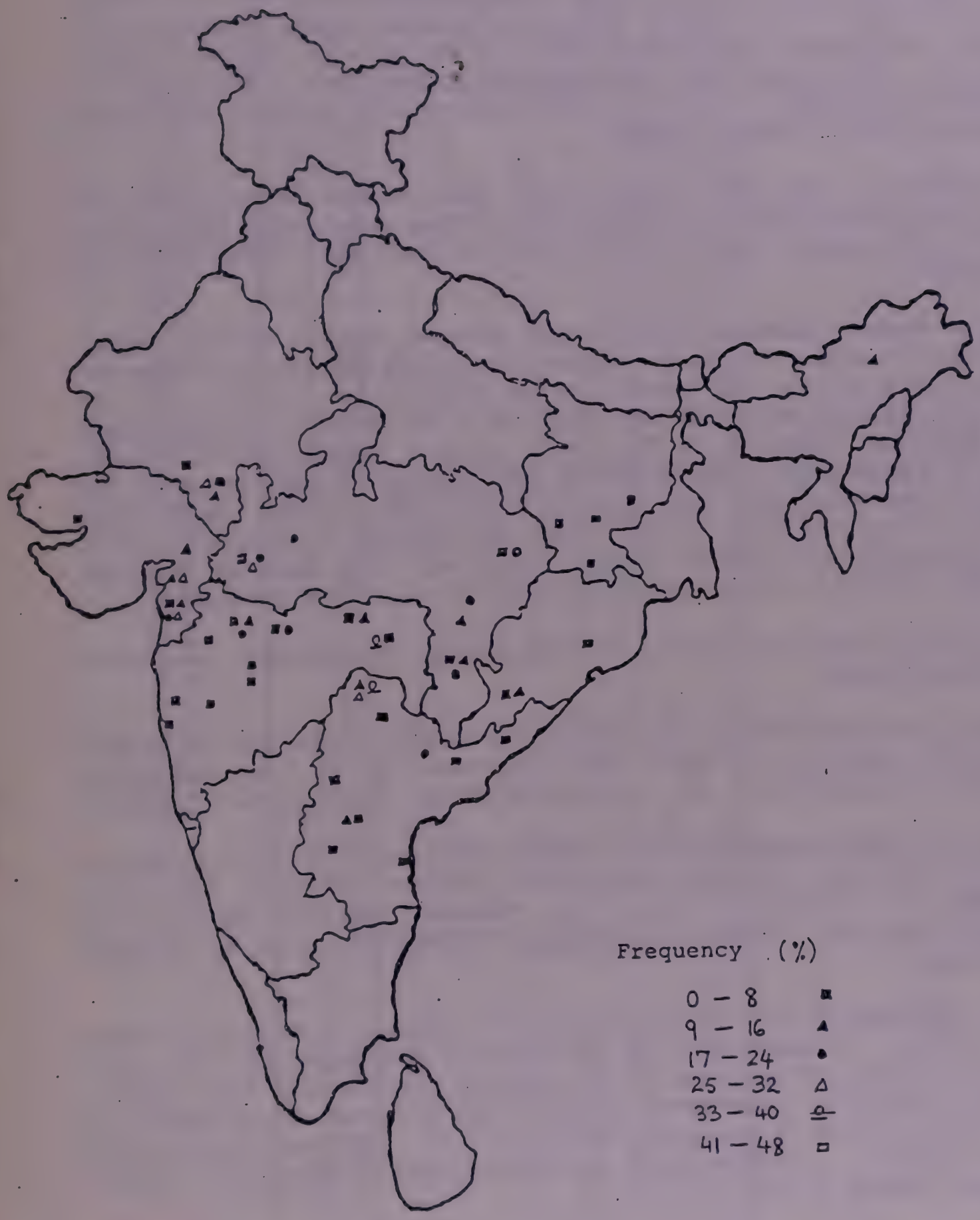
MAP 1. DISTRIBUTION OF SCHEDULED TRIBES IN INDIA



MAP 2. (G6-PD DEFICIENCY IN TRIBAL AREAS OF INDIA)



MAP 3. (SICKLE CELL DEFICIENCY IN TRIBAL AREAS OF INDIA)



CHAPTER 3

MALARIA CONTROL IN NORTH EASTERN STATES

The north eastern region of the country lies between 88^0 & 90^0 E longitude and 22^0 to 25^0 N latitude. The area is hilly, mountainous, eastern extension of himalayan ranges, extending upto Arakan region of Burma with Manipur Plateau region in between. The region has international border with Tibet region of China, Burma and Bangladesh. The river Brahmaputra with various tributaries forms broad valleys with riverine islands.

Annual rainfall in the area is more than 200 cm and makes this area simulate tropical conditions with dense forests, tea, coffee and rubber plantations. Seven states of north eastern region, Sikkim hill and terai part of North Bengal comprise this region.

The 7 north eastern states of India (under present review) include Assam, Arunanchal Pradesh, Mizoram, Nagaland, Tripura, Meghalaya and Manipur together contribute about 0.87% of the total malaria of the country (as in 1991) and the contribution to P.falciparum malaria is less than 10% of the country's P.falciparum malaria. The ecological features of the north eastern states permit intense, persistent malaria transmission (predominantly P.falciparum) in most areas of the region. Ecological characteristics that support vectors for intense transmission are compounded by the presence of more than one species of efficient vector mosquitoes. Chloroquine resistance in P.falciparum was first reported in India from Assam, where still some foci of RII/RIII level of resistance persists.

There are many tribal populations in these states living under persistent malaria transmission areas.

The region was identified as one of the hard core areas during NMCP. Malaria transmission stability was quite high, and the area has been subjected to large scale use of insecticides and antimalarial drugs for last four decades.

Comparative epidemiological picture of the 7 north eastern states (table-I) indicates that the disease incidence among the 7 states has been noticeably higher in 2 states viz. Arunanchal Pradesh and Mizoram. However the mean P.f infection intensity has been highest in Meghalaya (1989-91) followed by Tripura and Mizoram/Manipur.

The basic approach of the revised strategy for control of malaria in these 7 north eastern states will essentially be the same as envisaged for the rural areas (tribal & non tribal) of the rest of the country (ChapterII). The detailed current situation of NMEP in these states prepared by the State governments as requested by the task force is annexed (Annexures 1-6). However reports from Assam were not received. Brief account (as State profile) of malaria control activities in these7 states is as follows.

Table-1

COMPARATIVE EPIDEMIOLOGICAL PICTURE OF THE
NORTH EASTERN STATES (1989-1991) - SOURCE NMEP, DELHI

States	ABER			SPR			SFR			API			PF%		
	1989	1990	1991	1989	1990	1991	1989	1990	1991	1989	1990	1991	1989	1990	1991
Assam	9.52	7.39	10.18	2.87	3.65	4.47	1.83	2.10	3.02		2.69	4.55	6.38	57.5	67.6
Arunanchal Pradesh	28.52	25.32	25.33	10.14	9.60	9.79	1.32	1.16	1.30	28.78	24.30	24.79	13	12.1	13.53
Manipur	11.54	11.19	10.63	0.49	0.31	0.33	0.20	0.16	0.17	0.56	0.34	0.35	41.3	45.76	50.78
Meghalaya	11.90	8.54	11.67	5.43	5.56	5.09	3.94	3.55	1.47	6.47	4.75	5.93	72.6	69.33	71.05
Mizoram	38.48	28.48	28.51	7.98	7.86	6.69	3.97	3.48	3.11	30.71	22.37	19.06	49.7	44.30	46.44
Nagaland	4.32	2.18	2.18	6.95	7.89	8.78	1.92	1.47	2.30	3.0	1.55	1.91	27.6	20.71	26.17
Tripura	7.55	8.66	6.21	3.31	3.20	4.09	2.36	2.44	3.12	2.50	2.77	2.54	28.8	76.41	76.33

NAGALAND
STATE PROFILE

Introduction

The State of Nagaland is situated on the extreme eastern frontier of India. It is bounded by the States of Arunanchal Pradesh on the north, Manipur on the south, Assam on the west and in the east by Mynamar. Except for a few hundred square kilometers of plain area along the foot-hills bordering Assam and valleys along the river beds of Dhansiri, Dikhu and Doyang, the entire State is covered by ranges of hills and mountains varying from 190 to 4000 meters high above the sea level. Almost all the villages are situated in hill tops. Kohima is the State capital.

Geography

The total geographical area of the state is 16,579 Sq.Km. of these Kohima and Tuensang districts cover 4,041 and 4,228 sq.km. respectively. Except for the plains in foot-hills area which covers approximately 2,000 sq.km., the entire State is hilly. The forest occupies an area of 5,72,532 hectares. The percentage of the forest area to the total land area is about 35%. Rice cultivation occupies about 1,22,000 hectares and total irrigated area under crops comprises of 54,800 hectares.

Meteorology

Nagaland experiences 6 months heavy rainfall which accounts for the luxurious growth of vegetation. The monsoon starts from early month of May and lasts till late October. The average rainfall is approximately 250 cm.

The minimum and maximum range of temperature in summer is from 14.9^{0}C to 36.4^{0}C and in winter 2.0^{0}C to 22.7^{0}C.

Demography

a. The total population of Nagaland as per 1991 Census is 12,15,573. The Urban, Rural population break-up is 2,36,591 and 9,48,351 respectively. Tribal population comprises of 11,86,942.

b. Density of population is 73/sq.km.
c. The sex ratio Female : Male is 890:1000 males.
d. Literacy rate of male is 60.00% and female is 55.27%..

Malaria Programme in the State

NMEP was introduced in 1959 as one Malaria Unit when the State was yet under the administrative set up of Naga Hills Tuensang Area (NHTA). The Modified Plan of Operation (MPO) was introduced in the State in 1977 and the entire set up was re-organised as per (MPO) guidelines.

The PHCs in the State are located to suit the local terrain and do not conform to the standard prescribed for other States of the country as such the State was divided into 150 Malaria sections. 8-10 sections were grouped together to form into a reporting and implementing centre (IRC).

There are 15 IRCs in the State. Depending on the location, these IRCs are under direct supervision of district headquarters. There are 7(seven) District Headquarters. These districts are looked after by 2 Zonal Office located at Dimapur and Mokokchung. Out of the 7 revenue districts of the State, 3 districts have a common international border with Myanmar stretching about 200 kms in length which are in accessible thick forested area with no proper road communication.

The State has also one Urban Malaria Scheme located at Dimapur covering 35 sq.km area with 2 wards.

Malaria Epidemiology

The overall situation of malaria incidence in the State during the last 5 years reveals a marginal trend of decrease. However, the incidence of Malaria cases is predominantly in the foot-hill areas in Kohima, Wokha, Mokochung and Mon districts, which contributes to nearly 40% of the total malaria cases in the State.

When the epidemiological data for the last 5 years (1987-1991) are seen, it is observed that the ABER has been more or less at the same level at about 4.0 from 1987 to '89 and recorded a decline during the two subsequent years, 3.3 in 1990 and 1991.

API was recorded at 6.6 in 1987, and have registered a reduction to 2.13 in 1991. There has been a steady decline in PF cases from 30.3% in 1987 to 22.9% in 1991. During the period there was no report of death case.

When the epidemiological data is compared from 1985 to 1991, it is observed that there was significant decrease in positivity rate by 48.5% and PF case by 58.6% in 1988. The corresponding years 1989, 1990 recorded marginal increase, while in 1991 when compared to 1990 there was an increase in positivity rate by 10.3% and an increase of Pf case by 4.8%.

Vector Control Operations

Vector Control Operations in the State is carried out with DDT (50%) insecticidal spray, except for the Dimapur town which is under Urban Malaria Scheme and some areas in Phek district and Zunheboto district.

The total spray squads utilised for 2 rounds of DDt spray in areas above 2 API consists of a total of 59 squads on a yearly basis.

Anti-larval operation with anti-larval insecticides and malathion fogging are conducted in the areas under Urban Malaria scheme.

Administrative Problems

Of the many local problems, the most significant operational problems that hamper in the programme implementation in the field are as follows:

a. The introduction of MPW Scheme has adversely affected the case detection works therefore, uni-purpose case detection should be continued.

b. Existence of inaccessible villages particularly along the 16 km international border belt mobility is reduced because of lack of security.

c. Of the 1109 villages there are still many villages which are not yet connected by motorable roads. Therefore, due to lack of easy mobility, works are hampered.

d. Political interference particularly in the transfers of staffs is rampant, and therefore, workers who have familarised with the working conditions are affected.

e. Malaria workers are placed directly under the control of Civil Surgeon except in the two Zonal Headquarters. This arrangement has the disadvantage because of lack of control by the DMO.

Drug Situation

Following anti-malarial drugs are supplied by the Centre annually which are as follows :

1. Amodiaquine 5 lacs tablets
2. Primaquine 2 lacs tablets
3. Quinine Sulphate 50,000 tablets (1991)
4. Paracetomol 1,00,000 tablets (1991)

The drug supply position is satisfactory, however the proposed additional requirement for Amodiaquine tablets is 2 lacs per year.

TRIPURA

STATE PROFILE

Introduction

Tripura was known as 'Hill Tipperah' and the very much nomenclature is suggestive of its hiily nature of undulating surface made uneven by inter-spareced low hills. It is bounded by Bangladesh on its three sides.

The rural population constitute 93.08% of the total population. The shifting cultivation of the Tribals known as 'Jhum cultivation' is still being continued specially in the hill terrains.

The State has a large Scheduled Tribe/Scheduled Caste population who are still backward and deserves intensive cares and efforts for bring them to the optimum level of development.

Profile of Schedule Tribes

Out of the Scheduled Tribe population of 538.16 lac in India, the Scheduled Tribe population is 7.80 lac in Tripura which constitute 1.45% of the total scheduled tribe population in the country. In the State of Tripura the total population is 27,44,827 of which Scheduled Tribe population is 7,80,405 which constitutes 28.43% of the total population.

The total population in Sub-Plan area is 8,85,962 of which Scheduled Tribe population is 6,02,934 which constitutes 68.12% of the total population in Sub-plan area. The sub-plan area covers 7248.29 sq.km. comprising of 462 revenue villages out of total 10491 sq.km. area of the State and 864 Revenue villages of the State.

The epidemiological picture indicates that the State is endemic for malaria with high Pf percentage along with reporting of deaths also. The data are enclosed.

The State is under DDT Spray (two rounds) in rural area and in Agartala Urban area anti-larval spray has been continuing. At present 149 teams from NMEP budget and 4(four) teams from Refugee Relief Department budget are in operation seasonally.

The requirement of anti-malarials not only from the State health sector but also from the para-military organisation are enough. But due to constraint in resources the supplies do remain sometimes restricted to State Health Sector only. At present we are having chloroquine tablets 2.5 lac, Primaquine (2.5 mg) - 20,000, Primaquine (7.5 mg) - 50,000 with Injection Quinine - 12,000 amples and microslides - 15,000 only.

The State is having financial problems leading to non-availability of adequate fund to cater the needs of the programme. Moreover, imposition of L.O.C. system is also making the situation difficult. The budget provision for 1992-93 is 143.93 lac for rural and Rs.16.07 lac for Urban in the State share.

Problems

1. Infrastructure

The present position of staff in the State and District level need immediate augmentation from the pattern of 1977 to the actual requirement of 1992 besides filling up of all vacant posts.

2. Entomological

There is no entomological set up in the State.

3. DDT Spray

Augmentation of number of squads with increase of daily wages are very much essential.

4. Surveillance

The present strength of MPW are much less than the actual requirement besides Malaria Inspectors.

5. Laboratory Services

Non-availability of Laboratory Technicians in all the PHCs is causing much problems.

6. Fund

NMEP should be 100% Central sponsored scheme.

7. Medicines

Due to difficult geographical situation, all the materials may be supplied by the Centre as before including the pump machines also.

8. Vehicles

Non-availability of vehicles for supervision of the programme at the sub-Divisional/PHC level.

9. Special problems : Tribal Bangladesh Refugees in South Dist.

About 50,000 tribal bangladeshi refugees have been staying in different refugees' Relief Camps after crossing the international border. They have come from Chittagong Hill Track which is already ill-famed for malaria diseases. Special efforts are being undertaken to prevent spread of diseases in the locality.

Remarks

1. Tribal population in all over the state of Tripura is nearly 30% and subplan area is 70%

2. The API has been always more than 2 since last 10 years

3. High pf% ranging on an average 80% since last 10 years

Reporting of malaria outbreak with confirmed deaths frequent

The strategic International border with Bangladesh on its three sides (839 km of the total 1001 km border)

Hilly terrain within inaccessible communication

Poor economic situation

Limited resources of the state,-

It is felt essential that the whole State of Tripura should be treated specially as tribal State for preparation of revised strategy for control of malaria so that NMEP activities in this State could run smoothly and effectively.

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MANIPUR
STATE PROFILE

Status Paper:

1. **Organisational/Administrative set-up**

The whole unit of NMEP in Manipur have been decentralised to eight administrative districts of the State both in staff and administrative and programme works under the instructions of M.P.O.

One officer designated as Assistant Director is working as programme officer at the Head quarter, to co-ordinate state and centre, and giving assistance to the district Units.

2. **Staff**

200 Surveillance Workers, 50 surveillance inspectors 27 Malaria inspectors, 24 microscopists and 18 Field Workers have been decentralised to the district Unit according to the sections of the geographical boundary in the districts.

3. **Topography and terrain system**

Manipur, 22327 Sq.Km. in area, 18,26700 in population has 7 administrative districts (details : bid), or which 5 are hill districts and the rest 3 districts are in the plain area, covering 9/10 and 1/10 of the total area respectively, 880 villages in the hill districts are found as hard core village, some of which are not approachable at all during rainy season.

4. Epidemiological situation

a. The overall picture of epidemiological situation in the State during the year '85 to '90 shows a trend of positive incidence with an average decrease rate of 22%; but there is 6.4% increase from '90 to '91 with an average ABER of 11% during these years. Average SPR is 0.54% with the highest range of 0.95% in 1986 and lowest of 0.30% in 1990. Inspite of the low annual parasite incidence as calculated in the state total, which is below 2 during these periods, there is high Pf% ranging from 32.5% in 1957 to 59.2% in 1985 and also found a rising trend of Pf cases from '87 onwards.

b. Insecticide spray

The insecticide used for vector control is 50% DDT (WDP), spraying twice a year in the dose of 100 mgm/Sq.ft. On the basis of 2 API, under M.P.O. plus focal spray being practised in & around the positive cases outside 2 API sections.

5. I.M.S.

The epidemiological and other relevant reports are started from PHC to the district Head Quarter, then to the State Head Quarter by courier system and from State Head Quarter to the concerned authority by post.

6. Financial support

The programme is financed by the State and centre on 50:50 basis which is quite cumbersome Antimalarials and insecticides are received in kind from the centre. Other spray equipments are being purchased through the Head of Department from the available resources or received in kind from the centre.

7. Vehicles

Almost all the vehicles are old and found unworthy of the road in the hilly tracts; some of them being supplied as secondhand vehicle from the erstwhile PfCP. Details are enclosed in proforma.

8. Bottle necks

The State is facing some bottle necks at various levels in running the programme which can be summarised as under.

8.1 Administrative

The status, position and power of programme officer are not in accordance with the instructions of MPO, which makes him impracticable to be answerable for any problem in the district units. DMO (Head of the District Unit) and AD/Malaria are separately unanswerable to Director, Medical & Health Services, Manipur and no administrative control over District in the present administrative set-up, whereas he is made to answer for any problem in the districts. So it is impracticable for him to instruct the district units to gear up the programme in the district in respect of i) IMS, ii) supervision, iii) mobilisation of field staff and iv) disciplinary action for any lapse of duties by the field staff. He has no financial power to purchase the major parts of the Vehicle like tyre or battery to meet the emergency.

8.2 Staff

Out of the sanctioned staff, 21 S/W's and 5 Malaria inspectors could not be appointed because of financial constraints in the state. Out of 68 PHC's in the state only 24 microscopists are in position. 44 microscopists are needed which cannot be recruited because of administrative and financial problems. Man power development and utilisation in the proper place cannot be practised since Gr. III staff are not under the direct control of programme officer.

8.3 Vehicle

Vehicles are all old, received is 1985 or earlier, and are not road worthy in the hill districts. Big spare parts like tyre or battery cannot be purchased to meet the emergency which hampers the programme to a great extent. Many times vehicles breakdown in the hilly tracts and heavy expenditure in repairing the vehicles is always unavailable and programme is hampered many times because of the noncompletion of vehicle repairs.

8.4 Communication, publicity & Health Education

There is a gap in communication system mainly because of the difficult hill terrain in the interior parts of the hills, and satisfactory publicity and health education cannot be performed because of financial constraint. Law and order situation in the state particularly insurgency problem in the hill districts is a great hurdle in mobilising the field staff. In some hill ranges field staff cannot move round because of certain risks.

8.5 Finance

Untimely release of fund/LOC (letter of credit) is a constant headache. Inability to fill up the regular posts because of the financial constraint creates a big gap in running the programme.

Financial constraint pose a big problem i) in the encashment of contingent bills ii) in filling up the regular post, iii) in purchasing vehicles. The release of fund for spray wages or any other is very often untraceable, if not purchased by a staff particularly spared for that job. On an average, it takes nearly one month, iv) Socio-economic condition: Socio-economic condition and educational status in the unaccessible tribal belt is very poor which is a great hurdle to the self prevention measures and health educational communication.

ASSAM *

STATE PROFILE

Population (1991-C)	:	235.29 lakhs
No. of Districts	:	23
No. of villages	:	20745
No. of PHCs	:	151

	1989	1990	1991
Total Malaria cases	62274	64871	107572
Pf cases	39757	38936	72994
Deaths (due to malaria)	6	16	36
API	2.73	2.79	4.57
Pf%	63.8	60	67.9

DISTRICTS WITH HIGH API (1991)

		API	CASES
1.	Kanglong	22.66	14139
2.	Kokrajhar	19.90	21855
3.	N.C. Hills	17.12	2653
4.	Darrang	13.30	18135
5.	Dhubri	6.20	8325
6.	Kamrup	5.50	10630

Together these 6 districts account for 70% of States Malaria cases also 70% of State's Pf cases.

AGE DISTRIBUTION

Infants	0.65% of total cases]	
1-4 years	11.43% of total cases]	12.1%
5-14 years	31.3% of total cases]	

Most of the younger age group (0-4 years) cases are in the above 6 districts.

* Based on data obtained from NMEP, Delhi. Detailed information was not received from the State Government till the finalisation of this report.

SPRAY

Out of 2166 sections 995 sections (35% of state's population) is projected under spray. 68% of targetted rooms had been sprayed.

The transmission season seems to be between June to September. Spray has been started late in most instances.

District	Popln ('000s)	Total sectors	Popln Section	For Spray Popln	% popln case	Spray Coverage
K. Anglong	624	77	66	540	86.5	47-63
Kokrajhar	1097.4	95	62	691	63	28-44
N.C. Hills	155	27	24	81	52	59-67
Darrang	1364	152	54	460	34	78-81
Dhubri	1350	112	86	635	47	29-46
Kamrup	1957	220	70	313	16	69-73

Insecticide used is DDT in the above districts.

Table Districtwise Malaria situation in Assam (1991)

S.No.	District	Popl(000)	1991 Mal. cases		API	% PF
			Total	Pf		
1.	Dhobri	13,50	8325	7729	6.2	92.8
2.	Gopalpara	7,44	2919	2471	4.0	84.7
3.	Kokrajhar	10,97	21855	19209	19.9	90.2
4.	Barpeta	14,01	8605	6656	6.1	77.4
5.	Nalbari	10,69	1621	1373	1.5	85.0
6.	Kamrup	19,37	10630	9.131	5.5	86
7.	Darrang	13,64	18135	271	13.3	1.5
8.	Sonitpur	14,70	6050	2403	4.1	40
9.	Lakhimpur	8,01	133	20	0.17	15
10.	Dibrugarh	12,64	51	40	0.04	78
11.	Sibsagar	10,93	37	19	0.03	51
12.	Jorhat	10,74	39	10	0.04	26
13.	Golaghat	8,83	260	87	0.30	33
14.	Nagaon	18,58	4196	2873	2.26	68.5
15.	Kanglong	6,24	14139	12032	22.66	85.1
16.	N.C. Hills	155	2653	2087	17.12	78.6
17.	Cachar	12,79	2830	2692	2.21	95.1
18.	Karimganj	931	605	305	0.65	50.4
19.	Tinsukia	11,16	614	500	0.55	81.4
20.	Bongaigaon	4,02	1349	1271	3.36	94.2
21.	Marrigaon	5,46	670	461	1.23	68.8
22.	Hailakandi	5,75	737	716	1.28	97.2
23.	Dhemaji	4,95	1119	138	2.26	12.33
		235,29	107572	72994	4.57	68
24.	Urban areas: 23 towns	29,93	9251	5853	3.10	63.3
			8.6%	8.90		
	Deaths			36		

MIZORAM

STATE PROFILE

Introduction

Mizoram is the area comprising of the earstwhile Mizo District of Assam which under the British Government was called Dushai Hills.

Mizoram acquires a status of a Union Territory on 21st January, 1972 and become the 23rd State of the Indian Union on 20th February 1987. Sandwitched between Burma in the east and Bangladesh in the west. It has a total of 630 miles boundary with Burma and Bangladesh.

1. Epidemiology : Epidemiological parameters 1981 onwards in Mizoram as below:

YEAR	ABER	SPR	SFR	PF%	API
1981	34.30	10.30	5.70	55.04	35.50
1982	46.40	10.70	6.20	58.5	49.9
1983	31.0	8.70	4.10	50.30	29.70
1984	33.4	8.9	4.8	54.97	29.8
1985	37.02	8.39	4.24	50.58	31.04
1986	38.58	9.09	4.82	53.12	35.07
1987	34.35	8.02	4.08	50.96	27.56
1988	35.73	9.89	4.39	44.37	35.36
1989	38.44	7.97	3.96	49.72	30.67
1990	28.45	7.86	3.48	40.37	22.37
1991	23.48	6.68	3.10	46.39	19.04

Comparative Epdemiomological situation of 1991 and 1992 upto the month of September is indicated below :

Year	Popln	BSE	POS	PF	ABER	SPR	SFR	PF%	API
1991	655737	134895	9161	4322	20.57	6.79	3.20	47.17	13.97
1992	667546	188769	15727	8580	28.27	8.33	4.54	54.55	23.55

The above comparative epidemiological situation indicates that there has been increasing trends of malaria incidence during 1992 compared to 1991.

2. Vector Control Operation

There is no Urban Malaria Scheme in Mizoram. The entire area of Mizoram is hilly and forested with no big stagnant water excepting drinking water reservoirs. Main vector in Mizoram appears to be of A dirus (balabacensis).

There is no section less than 2 API in Mizoram, as such the entire state is covered with insecticidal spray except during 1991. After changing of insecticides with DDT, acceptance of spray by the people being increased and the API of 1991 has gone down to the lowest ever i.e. 19.04. But due to non spray of insecticides in 1991, acceptance of spray has become better with the achievement of 80.71 room coverage in the first round DDT spray 1992.

Under 50:50 sharing basis, Mizoram State contributed Rs.56.0 lakhs during 1992-93 which is just enough for meeting staff salaries and travel expenses. Central Govt. is expected to contribute another 50% of the expenditure including spraymen wages. since no fund release to meet expenditure for wages is received, payment of wages to sprayman is due till date. Due to the reason stated above and regular late release of fund from Central Govt. it is advised to abolish the system of 50:50 sharing basis.

Mizoram State has special problem of jhum huts which is not possible to include under regular insecticidal spray due to isufficient sanction of spraymen. Dr A.P. Ray who visited Mizoram in 1985 advised to include these jhum huts under regular insecticidal spray by increasing spraymen and suggested for a plan to workout man power requirement for jhum hut spray in Mizoram. Accordingly experiement was done and found that 100 additional spraymen will be required for sanction to include all the forty thousand huts in Mizoram under regular insecticidal spray. Sanction for additional man power required to spray jhum huts is repeatedly asked for but no positive reply is received till date.

3. Antimalarial Drugs

The efficacy of Anti-malarial drugs in use i.e. 4 AQ and 8 AQ seems to be decreasing as per field experience in the interior places. It will be highly appreciated if drug resistance test is conducted more frequent than the past. Results of 'In vivo' Chloroquine etc. sensitivity studies conducted in Mizoram since 1981 onwards is enclosed in the annexure.

4. Laboratory Services

There are 74 Nos. of Malaria Clinics in Mizoram and the Microscopist santioned posts is 40 only. 34 Nos. of Malaria Clinics are managed by the State by pulling difference cadres of staffs to work as Microscopist. Sanction for filling of all the PHC/SHC have been repeatedly forwarded to Director NMEP, Delhi but no positive reply is received. It will be appreciated if all the 74 Malaria Clinics are equipped with proper Microscopist.

RESULTS OF 'IN VIVO' CHLOROQUINE/AMODIAQUINE SENSITIVITY STUDIES CONDUCTED IN MIZORAM SINCE 1981 ONWARDS

S.No.	Study Area	Year	Drug used and doses	No. of cases treated	Results					Remarks
					S	S/RI	RI	RII	RIII	
1	Sairang PHC	1981	Chloroquine 1500 mg. in 3 days	57	19	10	19	8	1	28 days test cross check report awaited
2	Thingsulthliah PHC	1983	Chloroquine 1500 mg. in 3 days	8	4	-	4	-	-	
3	Serchhip	1983	Chloroquine 1500 mg. in 3 days	7	2	-	4	1	-	
4	Hnahthial PHC	1983	Chloroquine 1500 mg. in 3 days	8	5	-	2	1	-	
5	Tlabung	1983	Chloroquine 1500 mg. in 3 days	15	-	11	3	-	1	7 days test
6	Kolasib	1987	Chloroquine 1500 mg. in 3 days	19	10	-	8	1	-	28 days test
7	Hnahthial PHC	1989	Chloroquine 1500 mg. in 3 days	24	-	14	1	1	8	
8	Hnahthial PHC	1989	Amodiaquine	31	-	23	1	-	7	
9	Kolasib	1990	Chloroquine	9	8	-	1	-	-	
10	Sairang	1991	Complete report not yet received							

MEGHALAYA

STATE PROFILE

The State of Meghalaya is consists of 7(seven) administrative districts but for the purpose of anti-malarial activities Government of India sanctioned only 3 (three) Malaria districts while implementing Modified Plan of Operation for control of Malaria.

The State is mostly hilly Terrain and lying in between Bramaputra Valley of Assam in the North and Surma Valley of Bangladesh in the South. Most parts of the State consists of difficult hilly terrain with little or no Communication at all particularly during Monsoon season.

There is heavy rainfall from April to October. The rural people mostly live in thatched houses and in low lying areas where transmission of Malaria is high, these type of huts have very little side walls and for this reason insecticides coverage cannot be adequately achieved.

In Garo Hills district, the villagers live in Jhum huts in deep jungle areas for rice cultivation virtually during the whole transmission season and their houses in the villages are kept locked. Hundred of villages in Khasi and Jaintia Hills districts are rearing silkworms and beehives from the time of immemorial. Very little insecticides coverage is possible in these villages as people are not only refusing but are very hostile to DDT Spray as it indirectly effect their lively-hood.

It may be pointed that Garo Hills Districts are showing no respite in the incidence of Plasmodium falciparum infection since 1957 till date. Though there is no denying of the fact that much scope is still left for improvement of field activities, yet a fresh review is considered necessary to judge whether the strategy which was supplied for more than 30 years need some changes or not.

Few years back, when Government of India carried out drug resistance studies in different parts of our State, it was observed that may pockets in Garo Hills and Khasi Hills are effected with resistance.

The State Epidemiological Picture in the year 1987-1991

	1987	1988	1989	1990	1991
Number of malaria cases	10975	11863	10701	8209	11155
ABER	12.5	12.4	11.8	8.5	11.8
API	6.6	7.3	6.4	— 4.7	6.6
SFR	4.04	4.3	3.9	3.8	3.5
PF%	72.8	73.7	72.5	69.3	67.2
Deaths	1	-	-	-	-

Vector Control Operation

DDT Spray Data (State)

1.	No. of Districts under DDt Spray	7
2.	No. of PHCs under DDt spray	34
3.	No. of Sections under DDT Spray	179
4.	Total population under DDT Spray	883299

INSECTICIDES

Year	Requirement	Procure	Supplied Govt. of India	Consumed
1989	290000 Kgs	200 MT	200 MT	49664.25 Kgs
1990	67.50 MT	–	–	134022 Kgs
1991	320000 Kgs	270 MT	270 MT	122974 Kgs

DDT supplied by Govt. of India. No local purchase is made from the State. The amount we get is sufficient.

All anti malarial drugs are supplied by Govt. of India. The Drugs position of the State is given below :

Year	Name of Anti Malaria Drugs	Required	Supplied by Govt. of India	Consumed
1989	4AQ Amodiaquine	10,0000	10,00000 (26.6.89)	11,790000
	8AQ Premaquine 2.5 Mg 7.5 Mg	50,000 10,0000	Nil 1,00,000 (17.10.90)	– 1,00,000
1990	4AQ Amodiaquine	10,00,000	5,00,000	6,00,000 (2,00,000 taken from Jt. Director of Health Services Gauhati
	8AQ Premaquine 2.5 Mg 7.5 Mg	50,000 1,00,000	Nil 1,60,000 (28.9.90)	Nil 90,000
1991	4AQ Amodiaquine	3,00,000	1,96,000 (7.9.91) 500000 ------1.10.91 696000	6,50,000 –
	8AQ Premaquine 2.5 Mg 7.5 Mg	1,00,000 6,00,000	1,00,000(16.3.91) 6,00,000(11.3.91)	60,000 2,55,000
1992	4AQ Amodiaquine	7,00,000	Nil	–
	8AQ Premaquine 2.5 Mg 7.5 Mg	Nil Nil	15,000 45,000(20.2.92)	10,000 20,000

ARUNANCHAL PRADESH

STATE PROFILE

Arunanchal Pradesh is bounded by Bhutan in the West, China, Tibet in north and Burma in north east. The state is connected by road communication through Assam. The State is mainly hilly mountain area with different climatic environment. Several rivers, streams etc, cause main communication difficulties for which state is having poor road communication facilities. There are 111 tribes in Arunanchal Pradesh covering 84743 sq.km having the population of 631839 (1991 census).

The Arunanchal Pradesh has 12 administrative districts. The National Malaria Eradication Programme had been introduced during the year 1958 to reduce the case incidence of malaria to a negligible number, but not much has so far been achieved. Modifled Plan of Operation was introduced during 1977 on recommendation of expert committee from govt. of India with the following components one zonal component and 3 malaria district to implement the programme successfully. After implementation of MPO, to some extent mortality and case incidence has come down.

Spray

DDT is used for residual spray coverage in two rounds with 100 mg per sq.ft. with the spray schedule 16th April to 30th September/main transmission season. Average sprayable area of dwelling house is 4500 ft. Insecticides are supplied by the Govt. of India (Delhi & Bombay). During last 4 years the state is facing irregularities in receiving the sanctioned allotment of DDT due to transportation and other factors. Therefore spray operations in the state are irregular in following the spray schedule. Insecticide should have been placed well ahead of spray schedule. Besides that, the state is not covered by road communication in all the remote places, village and town and field staff is to engage local casual worker to carry load on head who are also not available now a days. As a result spray work and other works suffer and results in set back of coverage of spray work.

Surveillance

During 1966 surveillance was introduced to carry out the active collection covering 65% population of the state. Surveillance staff are covering almost all the vulnerable areas for collection and quick radical treatment of positive cases. In interior places of the state, considering case incidences, some new areas have been introduced under surveillance work.

Entomology

Entomological evaluation were carried out by the state entomologist and a Asst. Entomologist (Zonal tier) at Kimin. There investigation and observation of different places has been reflected to higher authority along with calendar and longitudinal duty report.

The following information was collected by them :

1. Indoor biting collection
2. Resting collection
3. Outdoor man biting collection
4. Indoor man biting collection
5. Dissection test
6. Contact and arial bio-assay test
7. Larvicidal collection
8. Susceptibility test

Species of Anopheles found are noted in order of density: A.maculatus, A.balabacensis, A.philippinensis, A.annularis etc.

Detected and declared vector is A.dirus, also suspected vectors as are A.philippnensis, A.annularis. At present as per the parameters given by the Director NMEP Delhi longitudinal and routine work is carried out in the state.

Laboratory

In modified plan of operation 11 NMEP laboratories were sanctioned. 14 Nos. NMEP laboratories are functioning and 12 laboratory technicians working with the help of malaria trained staff are engaged in NMEP laboratory. Laboratory technician and equipment are less than our need. Fresh augmentation is being made as this will help in decreasing the time lag between collection and examination and radical treatment. Hence we may expect better containment in the state.

Vehicular facilities

For smooth running of the programme work the supply of new vehicle is required. At present most of the vehicles are old and require frequent repairing due which the scheduled programme and work of malaria suffers.

Fund

After the declaration of the state hood of Arunanchal Pradesh Sharing the fund (CSS) 50:50 basis which is not at all adequate financially for implementation of programme works. The fund from govt. of India are released very late. As a result due to want of fund in time the programme work hampered. The fund allotment is not as per our actual demand. Arunanchal is very much difficult area so that provision of cent percent CSS may be kept considering the betterment of National programme work.

Transportation

It has been experienced in past few years that transportation of insecticide either from Delhi or Bombay are received very late. Sometimes after the scheduled spray period. This results in set back to spray operations.

Drugs

Chloroquine resistance has been established in tirap District by ICMR team in the level of R-1 R-2 and R-3 resulting in change of drug.

Accommodation

The State Govt. is reluctant to provide money for accommodation of programme workers/surveillance staff posted in the periphery. No rented accommodation is available in the remote places/villages. As such provision of fund allotment may be considered for construction of good no. of buildings.

Conclusion

Hence, over all work of NMEP situation in Arunanchal Pradesh, it appears case incidences is improving steadily over the last ten years in spite of peculiar geographical/climatic problems etc.

CHAPTER 4

URBAN MALARIA CONTROL

Introduction and Overview

Malaria as a problem of community has been recognized in certain towns from early period of HISTORY OF MALARIA IN INDIA. Towns like Madras, Salem, Erode, Namakkal, Tiruppur (all in Tamil Nadu), Vijayawada, Vishhapatnam, Kurnool (all in Andhra Pradesh), Calcutta, Ahmedabad, Baroda have been reporting malaria before National Malaria Control Programme (NMCP) was launched in 1953. However urban areas were not covered when the National Malaria Eradication Programme (NMEP) was launched in 1958.

Under NMEP rural areas had meticulous surveillance system, which provides data on malaria incidence and its distribution on different axis like geographical, temporal, age and sex of the patients, species of Plasmodia involved, their response to chloroquine etc. Also, some of the important particulars on the vectors of malaria in different parts of rural India are available. Such data are not available for all urban areas (U.As). It is an exception for a town to have an active surveillance mechanism. Malaria patients treated by private practioners or in various dispensaries, hospitals are not notified to Urban Health Authority. The data on the incidence of malaria in urban areas is therefore very meagre.

Epidemiological investigation of malaria cases in rural areas well brought out the role of certain towns acting as epicenters for disseminating malaria to rural areas through transmigration of people between these areas. Hence the URBAN MALARIA SCHEME (UMS) was launched in 1971. There is however lack of adequate epidemiological data on malaria in Urban areas of India.

Though it is 20 years since UMS has been launched its progress is very slow. In 128 towns only, out of 3301 census towns (1981-Census), UMS is functioning. Out of this, data for 125 towns are available for 1991. The data relates to 74 million people, i.e. to 9% of India's population. They have accounted for 9.86% of India's Malaria cases in 1991 (Table 1).

Table 1. Showing the proportion of Malaria incidence in 1991, between rural & urban parts

	Area in Sq.Km	Population in — Million (1991-C)	Recorded Malaria Cases
All India	32.87 (100)	844.3 (100)	2147460 (100)
Rural	31.43 (95.62)	627.15 (74.28)	1935590 (90.13)
Urban	1.44 (4.38)	217.17 (25.72)	211870 (9.86)*

Note : * The data on malaria is from 125 urban areas with a population of 74 million (8.76% of India's population).
= Figures in parenthesis indicate percentage.

Table II. Showing incidence of malaria in Gujarat State for 1991 and in 40 of its towns.

	Population (Million)	Malaria Cases	% of		
			Population	Cases	
Gujarat State	41.17	404735	100	100	
17 towns under NMS	3.15	39589	7.5	9.78	-
23 other towns (not UMS)	2.7	24291	6.4	6.00	15.78

An analysis of the available data of Gujarat State (accounting for 25% of India's cases) for 1991 reveals that out of 40 towns reporting malaria 17 towns are under "UMS", 23 towns are not. The 40 towns report 63880 malaria cases, (Table II) i.e. 15.78% of State's malaria cases. But only part of these cases (62%) is included in the figures in Table I against Urban Area.

Apart from those 40 towns there are a number of smaller towns in Gujarat State where malaria is said to be a problem, but details of malaria incidence in each of these towns are not available. This illustrates the difficulty :

i) in fully understanding the quantum of "Urban Malaria" in the state and;

ii) in identifying the towns where malaria is a problem to reckon with.

The tables III and IV show the proportion of urban malaria in certain states, and the increasing trend of malaria incidence.

Even though the precise magnitude of the URBAN MALARIA PROBLEM is not known and so is to be studied by scientific methods that are available, we can surmise from the above tables, that Urban Malaria is a serious problem in almost all states except in Kerala, Jammu & Kashmir, Himachal Pradesh, and in towns in hill stations. Rapid urbanization with its concomitant migration of people, increase in construction activities, increase in slums and slum dwellers offer ideal conditions for the breeding of An.stephensi, the vector of Urban Malaria.

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Table III. Showing the proportionate incidence of malaria in some urban areas in some states of India in 1991.

State	No. of towns Reporting	Their total Population (in lakhs)	Malaria cases reported by these towns	Percentage to	
				State's Population	States total cases
Tamil Nadu	10	58.71	86915	10.5	59.14
Andhra Pradesh	8	37.74	23150	5.7	28.13
West Bengal	1	41.43	13354	4.13	13.19
Punjab	13	28.1	4289	13.9	11.70
Haryana	15	26.62	3622	16.3	10.7
Gujarat	17	30.15	39589	7.5	9.78
Maharastra	15	164.19	8240	20.8	5.67

Table IV. Showing increase in Malaria cases in 4 Metros of India

Town	No. of Malaria Cases in			% variation over 1975
	1975	1981	1991	
Bombay	2743	557	5335	+ 94.5
Calcutta	2692	5527	13354	+ 396.0
Delhi	11165	62415	8498	(-) 23.9
Madras	36207	44951	67013	+ 85.5
All India	5166142	2701141	2147460	(-) 58.4

Problems/Issues of Concern

1. The extent of malaria in an urban area is not well identified; (a) due to lack of NOTIFICATION by Medical practioners, (b) due to absence of epidemiological studies by Health services of the urban local body or by the State Health Services.

2. The health services in Urban areas are unevenly developed. The mosquito control programme is implemented as pest abatement" programme rather than as a disease control programme. So the control of breeding of An.stephensi is rarely attended to by the sanitary staff of the urban area.

3. There is lack of well trained staff to plan, implement and provide the necessary technical and supervisory support for vector control measures.

4. The breeding of An.stephensi is almost always in "man made" water collections in and around the houses. But community members are not aware of the breeding of the malaria vector in their wells, OHT, cisterns, water storing receptales (drum, barrels, masonary constructions) and how to prevent this breeding without affecting their daily needs of water.

5. In urban areas different agencies are entrusted with construction of buildings, drains, water system for domestic needs, road laying, electricity, etc. Their activities contribute to water stagnation and mosquito breeding.

6. Lack of services to screen labour aggregation helps in building malariogenic condition. The urban health services are therefore not able to insist on the contractor to notify the arrival of labourers to urban local authority.

7. The necessary legal back up to enforce anti-mosquito measures is not available to many urban local authorities as appropriate bye-laws providing adequate obligations on citizens, on construction agencies are yet to be 'passed' by the council of the urban area.

8. Industrial complexes and their residential colonies associated with these complexes in the vicinity of urban areas are without adequate precautions to avoid mosquitogenic and malariogenic conditions.

9. Lack of finance in the urban local body to organize, and implement for years a well designed anti-vector, anti-malaria programme in all parts of the urban area. Many municipalities are having financial insufficiency. The UMS was a 100% centrally financed scheme till the beginning of VIth plan when it was converted as a 50:50 cost sharing scheme. Some Municipalities are not in a position to take up the UMS.

10. UMS was technically merged with NFCP. The IEC and the anti-larval activities against An.stephensi breeding are different from the anti-larval activities against culex quinquefasciatus. These have not found their due place in UMS.

Revised Strategy for Urban areas

1. The present criteria for inclusion of a town under UMS are :

"i) The town should have a minimum population of 40000;
ii) The annual parasite incidence should be 2 or above during the preceeding 3 years."

An anlysis of 128 towns implementing UMS shows that the population of three towns viz. Rasipuram, Ellampillai (both in Tamil Nadu) and Upleta (in Gujarat) is less than 40000. This shows the flexible application of the population criterion when conditions warrant. But this criterion of population needs to be reconsidered as many towns with lesser population have persistant malaria problem and the flexibility should be a unversally applicable depending upon local needs.

2. The district epidemiological cell covering an urban area should develop microplan based on the principle enunciated in chapter 5 of this report.

3. The criterion of API requires re-evaluation based on microplan. The API for the whole town masks valuable local epidemiological factors. While the API for the whole town may be less than the present cut off API, the API of certain wards or identifiable localities can be very high. Detailed locality wise epidemiological data in towns with low or high API will reveal parts of the town with high incidence and transmission of malaria. Presence of such foci has to be identified and dealt with coost effective containment measures appropriately before the transmission potential is built up.

4. Notification of malaria cases diagnosed by various medical practioners in an urban area, either in individual clinics, dispensaries or in hospitals is an exception. So the data on incidence of malaria in urban areas is subject to various grades of under-reporting. The API worked out on this "reported" cases will not reveal the actual status of malaria in that urban area. In the absence of surveillance as in rural areas, SENTINAL DIAGNOSTIC CENTRES can be established for gathering 'data' on malaria incidence in urban areas. Sentinal centres can be established in all :

- Medical college hospitals
- District headquarters - Hospitals
- Taluq hospitals
- Hospitals of railways, Port Health Authority
- Selected dispensaries in urban areas

5. Another mechanism can be to conduct 'MALARIA SURVEYS' in the population on a sampling basis.

6. In the control of breeding of An.stephensi community members have greater role in eliminating sources of breeding. Recurrent anti-larval measures by the staff of urban authority are very important at the present juncture, till the motivation in the community to control breeding of An.stephensi is high enough for sustained action to eliminate and not to create new potential breeding places for An.stephensi. Yet there are many operational constraints in implementing an effective anti-larval operation on a long term basis and fully involving the community. Such constraints can be (1) inadequate staff, (2) inadequate larvicides because of poor logistics, lack of budget allocation, lack of finance with the urban local body, (3) poor organization, (4) poor management, (5) want of commitment among anti-

larval workers and supervisors, (6) refusal by people (7) inaccessibility of breeding places (8) failure to locate all breeding places/spots in every premises/building etc. (9) failure to motivate sustained and adequate community involvement. Many these constraints can be mitigated through active community involvement from the early stage of formulation of a malaria control programme in an urban area.

7. An adequate, appropriate and sustained health education for social mobilization should be an in built component of UMS. Sufficient funds must be earmarked for health education activities under UMS. Such activities will include training of all staff in methods of health education esp. in conducting interpersonal educational sessions, in "small group meetings" of the community members, so that the community members favourably act to eliminate the existing breeding places in and around their habitats.

8. Mosquitogenic conditions are created by "construction agencies" including engineering departments, water supply and sewage departments, and the engineering department of the urban body itself, by not constructing mosquito proof water storage facilities and maintaining them properly. Engineers, building overseers, etc. are to be oriented in designing, constructing and maintaining water storage systems, water supply system, plumbing system in buildings, as well as in the community so as not to breed mosquitoes. The urban body and engineering departments shall have building codes wherein standards of mosquito proof constructions are laid down and these standards are scrupulously followed.

9. Urban bodies should have legal powers to prosecute those who violate building rules/codes during construction, maintenance.

10. Passive Case Detection : Dispensaries, hospitals organized, established and maintained by the Government, local authority or by NGOs offer their services either "free" to their patients or on payment of a fee. Any patient is free to choose any facility. However, the poor, the slum dwellers and, the lower economic group of people will be using the "free" facilities nearer to their work place or residence. So it will be worthwhile to setup a "malaria clinic" as near to the residence of poor people as possible, and in any case in each of the dispensaries by equipping them with a good quality light microscope and microscope slides and other accessories to stain and examine blood smears for malaria parasite. Each malaria clinic shall be staffed with a trained microscopist and shall be adequately supervised by the Medical Officer of the dispensary and other technical supervisors. The working hours of the malaria clinics can also be "extended" beyond the normal working hours of the dispensaries so that its services are available to those who feel the need for such services "outside the normal working hours" of the dispensary and on all days of the week. Depending on the "demand" additional microscopists and pharmacists can be posted for 2 or 3 "shift" working, if necessary. The availability of such services shall be well publicised in the community.

The passive surveillance can be further strengthened by organizing and sustaining **Fever Treatment Centres** (FTCs) within the community, through a trained volunteer selected by the community, from among its capable motivated adults (male, female). One FTC can be organized for a group of 100 families or for one cluster of habitations if with less than 100 households. Regular, periodic meeting between the FTC-volunteers and the area Health Staff (Sanitary/Health Inspector) will help in early treatment, proper follow up of fever cases, in replenishing anti-malarials, lancet.

microscopic slides, besides encouraging the volunteers and the community in anti-malaria activities. Suitably trained FTC-volunteer can also act as the local "anti-vector promoter" by guiding other members in reducing An.stephensi breeding sites in that colony. The FTC volunteer will organise the community for accepting pyrethrum spray whenever space spray is to be done.

11. Active Case finding : As the cities and towns are fast developing, number of new residential colonies spring up on the periphery of the city's/town's limit. The geophysical conditions of such areas are more like that of the neighbouring rural areas. Families who settle there are far removed from health facilities, and have limited transport. Because of construction activities, labour population gathers in these places; new wells are dug; much water is baled out and stored; and ideal conditions for breeding of An.stephensi are created. Malaria outbreaks occur, and malaria endemicity builds in those areas. To cater to the needs of such isolated pockets the local body has to organize active case detection and treatment. The number of staff required for this has to be determined by the local body taking into consideration the location of such isolated pockets, the population residing there, distances to be covered by the worker to move from one isolated area to other so that he can visit each of the areas once a week. For calculating the manpower requirement, we can take this as 1 per 20000 population. He can also take action to set up FTCs in that area and help the residents to practise anti-larval measures aimed at reducing An.stephensi breeding.

12. Health posts are set up in some of the towns. The FTCs in an area can be grouped together and linked to the Health Post so that the staff of the health post can sustain the motivation of the FTCs, and all anti-malaria activities can also form part of the spectrum of activities of the outreach services of the health posts. Pregnant women and children form high risk group for malaria. So the A.N.M. (female multipurpose health worker) in health posts shall pay special attention towards proper investigation, diagnosis and treatment of any fever case among pregnant women and children.

13. Treatment with first line drugs shall be available at the malaria clinics and in all dispensaries, hospitals of Government, and local body. The medical practitioners and "consulting physicians" in other facilities agencies are to be suitably motivated (1) to have their clinical diagnosis confirmed by the laboratory (2) to prescribe second line drugs only after evaluating the non response of "malaria" patient for the first line anti-malarials (3) to notify the malaria cases to the local health authority. The physicians and the nursing staff of the medical wards in taluq, district hospitals and medical college hospitals, and other referral medical institutes are to be trained and re-trained in the current methods of treating "non responders" to first line and 2nd line anti-malarials; and in treating and managing critically ill patients. The medical officers at the periphery are to be trained to identify critically ill patients at the early stages so as to arrange for their referral to the referral institution(s) that may be present in the same town or in other towns within the district. The referral institutions shall be equipped suitably and adequately and they shall have stock of various anti-malarial drugs, supportive drugs and injectable fluids.

14. Reduction of transmission of malaria in urban areas can be achieved by (1) reducing the number of potential breeding places of the vector of malaria in urban areas, (2) by taking "personal protection measures against possible "bites" by the vector mosquito.

The main vector for urban malaria is An.stephensi. At the periphery of urban areas, in some instances An.culicifacies too is a vector.

To reduce the density of A.stephensi all the possible breeding places of this vector are to be identified and properly attended to. The action called for may be :

- to empty small collections of water and keep the containers dry;
- Not to allow water to collect and stagnate (store) for a continuous period longer than a week. Either that water is used for any domestic purpose, or is drained away ensuring that no aquatic stages of the mosquito are present in the vessel, before refilling;
- where large volume of water is present as in Wells, to make the wells mosquito proof-HERMATICALLY SEAL; ventilating shaft, if any to be closed with a mosquito proof wire mesh;
- not to dig new wells, but to go in for tubewells, or bore wells if subsoil water is to be tapped;
- to cover all water storage tanks (roof top) (ground level) (of houses, factories, offices or public places, parks etc.) so as to be mosquito proof;
- un-used wells, tanks to be filled up with sand etc. and covered or closed so that rain water cannot collect in them;
- OHTs not in use are to be demolished; if not possible, to be closed so that no water can collect in them during rainy days;
- the building or engineering contractors are to ensure that water is not stored for more than 7 days in any container. That all such containers get completely emptied of its water and then allowed to be dry atleast for an hour. Where water is allowed to stand on cement/concrete floors or in curing tubs, such water is replaced once in 6-7 days, or treated with any larvicide.
- where the well, OHT cannot be made mosquito proof, or till it is made mosquito proof a suitable larvicide has to be used. This larvicide can be Temephos, applied in the dosage of 1 ppm (i.e. by volume); and wherever possible indigenous larvivorous fish to wells.
- Most of the measures listed above are to be done by the family members. But it requires sustained action from them. Their motivation to act can be obtained only when every individual who can act knows the role of An.stephensi in malaria transmission in towns, its breeding places, and how such breeding places can be reduced by proper construction, and house keeping. A well conceived communication programme shall take care of this activity of the community.

- Engineers and engineering contractors (i.e. construction agencies) play a great role. Wherever OHTs are constructed, these are to be mosquito proof, easily accessible for any staff of the Anti-malaria team to "inspect" such OHTs for studying "breeding" in them, applying larvicide where necessary; to maintain such OHTs always in proper condition, and to remove it when not needed. They shall ensure "curing" without breeding of mosquito by draining away the "curing" water by 6th or 7th day, or treating that 'water' with a larvicide.

15. Use of bednets of proper mesh size, preferably impregnated with a residual insecticide (synthetic pyrethroids) is to be encouraged in all places especially where there is active transmission of malaria. Good education campaign is to be there to inform people on the proper use of the nets; and to get it periodically impregnated with the residual insecticide. Labour contractors are to be legally insisted to provide a bednet of proper mesh to their labourers. Similarly use of mosquito repellent, creams, oils on exposed portions of the body from dusk onwards upto bed time is to be encouraged. Insecticide impregnated mats, coils giving out fumes on ignition are available. They act as repellants.

16. **Social Mobilization** is an important component of malaria control activities especially in an urban setting as the breeding of <u>An.stephensi</u> is mostly promoted by the life style and actions of urban people. So the urban population has to be well informed about cause of malaria in their town, its mode of transmission among them through the vector, the life cycle of vector, its favoured breeding places inside their houses or buildings and in their neighbourhoods; and how by their simple precautions during building a house, they can make permanent mosquito proof wells, OHTs, sumps, GLR or cisterns. The IEC sessions should be organized to the staff of the various Government Offices, Industrial establishments, business/ trading sectors, educational institutions etc. to exchange information on malaria, its vector and its control.

17. Special attention shall be made to establish good contact and coordinated activity with the construction agencies (CAs) like engineering and other service departments like housing boards, slum clearance organizations, metro water supply and sewage organization, railways, highways, public works department, port authorities, defence establishments. Each agency must be well informed about their role in achieving the objectives of this programme and the relative roles of other agencies, so that each coordinating agency can jointly work with other agencies to help to achieve the common objective.

The <u>State level coordination committee</u> can be constituted with the Chief Secretary to the Govt. of the State as the chair person and the Director of health Services as the convener/Member-Secretary. The Secretary to various departments like MPL.Admn, Health, PWD, Housing, Transport, Education, Water Supply and the heads of departments of Slum clearance, PWD, Highways, State housing board, State Electricity, Education and representatives of defence, railways, ports, etc. will be its members. The inter department issues which could not be solved at the urban area coordination meetings within the respective urban areas, and policy issues will be discussed and decided upon. This committee can meet once in six months, and pass on their minutes to the Urban Authorities for their guidance.

18. Stratification of urban areas as per the malaria endemicity cum malariogenic potential will help the authorities to demarcate the areas where they shall concentrate their efforts and deploy or utilize their scarce resources on higher priority. Based on the information generated by district epidemiological cell on the parameters as enumerated in chapter 5 localities in an urban area can be identified and an overall, stratification can be done for selective control measures.

19. While all towns are to take up measures towards reduction of breeding of vector mosquitoes (including An.stephensi) higher priority can be given to the following categories of towns for control of Urban Malaria :

- Towns now reporting malaria
- Towns attracting pilgrims and tourists
- Towns with seaport
- Towns which are centers of trade and commerce attracting rural people in search of employment

20. Urban Malaria control activities will form a part of the overall basic health care delivery system of the urban area.

21. The executive authorities of urban local bodies, along with their municipal engineers are also to be oriented. They may have to be exposed to some details of operation of UMS as some of the urban local bodies do not have the post of Health officer or P.H. Entomologist. The training/orientation is to be complimented by strengthening the organisational environment in which the staff of UMS have to work.

22. Training needs of medical and nursing personnel should be adequately taken care of. Special emphasis is to be laid on their obligation to notify to local health authority.

23. The supervision of the activities of these squads in a sanitary division will rest with the divisional sanitary inspector of that division. The area and population of the sanitary division shall not be unwieldy or with too many structures. Norms for these also are to be re-defined.

24. Depending on the size of the urban area and its density of population the supervisory staff at the city/town level will vary. For every five sanitary divisions one entomological assistant (Jr. P.H. Entomologist) can be posted, after suitably training him/her. Where the population of the urban area or composite urban area exceeds three lakhs one senior P.H. Entomologist can be posted.

25. The district epidemiological cell (District health organisation) can select certain clinical institutions situated in the urban area and attracting large number of patients and staffed with well trained, dedicated microscopist and other staff as SENTINAL CENTRES to collect details that will be useful for generating epidemiolgical data leading to identification of new foci, or emergence of any degree of resistance among malaria parasites for anti-malarial drugs, besides other information regarding trends, etc. This team will also do special entomological studies, in addition to organizing and reviewing routine entomological monitoring,

26. Culex quinquefasciatus is the sewage mosquito breeding ubiquitously in all stagnant waters with puterifying organic matters. Its breeding sites are spread throughout the length and breadth of the urban area, more in areas with large number of cess pools/cess pits, defective drains, ill-maintained drains, defective septic tanks, ill maintained sewage plants, in lands irrigated with raw or partially treated sewage. The best anti-larval

action for checking breeding of this mosquito is that which keeps water (Sullage sewage) flowing. This may be by properly designing and constructing drains to allow free flow of fluid and by proper and timely maintenance of the whole drainage systems, or sullage and sewage collection, treatment and disposal system of the urban areas. The public too have to ensure that the free flow in drains is maintained and not hindered by their throwing garbage, etc. into the drain.: In unsewered areas construction of properly designed SEPTIC TANKS and soakpits and their proper maintenance by the house owners will help to reduce breeding of this mosquitoes.

PHASING OF REVISED UMS

Preparatory, implementation and maintenance phases of UMS are suggested. However these are obly indicators, and details and modes of operations, etc. to be worked out by State governments/NMEP.

During preparatory phase the following activities can be done:

- Generation of baseline data as district microplan (chapter 5) to enable stratification for operational activities for the control of malaria.

- Recruitment of staff needed and their training;

- Training the existing personnel of urban authorities, based on training needs assessment.

- Identifying training facilities in the districts, states and suitably strengthening them by orientation, equipments, teaching aids, etc. getting the faculty trained at National and State level institutes.

- Mobilization of other resources by each urban authority and by district functionaries involved in UMS.

- "Communication needs assessment" with reference to Malaria Control; and planning IEC Programmes;

- Legislation : Adopting bye-laws for preventing mosquitogenic conditions and for removing existing mosquitogenic conditions;

- Formation of coordination committees at National,State and Urban body levels;

- Establishment of FTCs, Malaria Clinics, Referral centres and publicising regarding the availability of these facilities;

- Launching of multi-media IEC programme and ensure its continuation.

- A good management information system should be built in as a part of the UMS and the information will be used for bettering the performance under UMS. The state health authority can arrange for an annual review of the implementation of UMS by pooling state's technical manpower, supplemented by experts from National level where needed. The findings of the annual review shall be discussed at the state level coordination committee for strengthening the activities of any urban area where necessary.

Summary

There is gross under reporting of incidence of malaria in urban areas. Even the data available represents only a few towns. The need for mounting epidemiological studies to know the actual status is stressed. However on the basis of available data stratification of towns, wards, streets (slums, colonies) can be made and appropriate control measures instituted. Stress is laid in the revised strategy on sustained community involvement on coordination of intersectoral activities to ensure prevention of breeding of vectors by good engineering and housekeeping practices; equipping local bodies with legal backup to ensure compliance of anti-malaria measures by construction agencies, and recalcitrant members of the community; on providing sufficient diagnostic treatment facilities, on development of a hierarchy of leadership through the mechanism of coordination committee at local, state and national levels for this programme.

CHAPTER 5

DECENTRALIZED MICROPLANNING FOR MALARIA CONTROL

The current strategy of malaria eradication under NMEP essentially involves centralized planning, monitoring, evaluation and field operations. The role of States is only to implement the programme through their district level health officials. Epidemiology of malaria is a local parameter, and may even vary from village to village, depending upon ecological and social diversity. India is a vast country with extremes of variations in climatic conditions and landscape ecology often resulting in great diversity in epidemiological characteristics of the disease in tribal areas, other rural areas and expanding urban towns. The centralized planning of malaria eradication/ control therefore cannot cope with the demands of local needs, and has been a major contributory factor in slow/poor development of capabilities at the state/district level. There is thus an urgent need for a decentralized microlevel planning at district level with regard to epidemiological, entomological, environmental and socio-cultural factors in relation to the dynamics of malaria transmission.

The concept of decentralized microplanning envisages management of malaria control activities with responsibilities delegated to those who are closest to the problem and can employ available resources most appropriately. For malaria control operations planning has to be ensured at the district level by the district epidemiological cell. The cell would function as a nodal unit for all microplanning and implementation of control measures. Broadly, the cell should be entrusted to carry out the following activities.

1. Generate data on clinico-epidemiological, parasitogical, entomological, ecological and operational aspects of malaria control including treatment.
2. Preparation of microplan for malaria control based on analyses of the data and ensure its implementation. The modalities of implementation to be worked out by the state governments.
3. Analyses and interpretation of all the data generated for the district, for timely modification in control strategies at local level.
4. Monitor and evaluate all malaria control activities.
5. Preparation of predictive models to forecast epidemics.
6. Active participation for promotion of intersectoral coordination for malaria control activities.

The essential composition of district epidemiological cell would be :

1. **District Epidemiologist** (A qualified public health post-graduate with adequate training).
2. **District Entomologist** (A qualified medical entomologist with postgraduate or doctoral degree in medical entomology).
3. **Statistical Assistant** (A post graduate in statistics, preferably biostatistics).
4. At least 3 laboratory technicians with training in malaria microscopy, 3 insect collectors and 2 lab. attendants.
5. A well equipped laboratory for parasitological and entomological work.
6. A computer system, connected to national computer network.

7. An efficient mobile unit for extensive field work.

It may be reasonable to point out here that an *in situ* promotion system based on 5 years assessment should be introduced for these district level specialists.

Parasitological data to be generated by the cell should, through parasitological indices elicit information on (i) prevalence rate, (ii) the species wise parasite load/extensity of infection in a population, and (iii) the intensity/ density of infection. These three basic informations should be classified species wise and parasite stage wise, with respect to age/sex and season.

Body temperature surveys need to be conducted in different populations with varying degree of malaria endemicity. Unusual clinical manifestations of the disease should also be recorded and their frequency of occurrence determined. Failure of drug should be monitored carefully and reported to the zonal *P.falciparum* monitoring team for tests of drug sensitivity.

Entomological data to be generated by the cell should elicit information on i) degree of man-mosquito contact (ii) density pattern of mosquitoes (per hut/ room/shelter and per man hour), (iii) trophic levels of indoor and outdoor resting mosquitoes and the duration of indoor resting (iv) parity status of vectors (v) human blood index, and (vi) duration of gonotrophic cycle.

Density of immature stages in relation to the habitat characteristics and diversity needs to be estimated with season.

Extensive and intensive data on ecological parameters (abiotic and biotic factors) which are intricately associated with the vector dynamics needs to be collected along with epidemiological and entomological information.

Proper analysis of these data will not only be useful in formulating control strategy but also help in forecasting of epidemics and stratifying areas with respect to transmission potential, proneness to epidemics, malaria endemicity and operational activities. In urban areas too this information will be useful in microstratifying localities with foci of intense transmission.

The data generated for various parameters should be critically analysed with biostatistical tools. Since parameters involved in the dynamics of malaria transmission are highly dependent, multivariate analysis of variance (MANOVA) can provide suitable answers for stratification of most areas, for appropriate and cost effective control activities.

CHAPTER 6

INDUSTRIAL MALARIA CONTROL

Introduction

In India, due to high endemicity of malaria, the speed of developmental processes for industrial growth, urban expansion, utilisation of waste land for agriculture, irrigation, forest based industry, among others, have always been adversely affected by the high morbidity and mortality caused by malaria, particularly due to recurrent focal outbreaks of P.falciparum malaria. The initial stages of development of industry witnesses high morbidity/mortality and subsequently continued morbidity becomes a regular feature. Several man days are lost in the process and the industry often suffers serious losses due to ill health of their workers. These industrial units, whether of private or public sector undertaking often create their own, though meagre, health infrastructure, and occasionally also utilise the district malaria services (from NMEP) for control of malaria in their organization. Experience has shown that the district authorities, due to inadequate staff, administrative and financial problems are not able to render adequate services for controlling malaria in these industrial complexes. Consequently, foci of malaria transmission get established within the premises of industrial complex. Malaria being a vector-borne disease, spread of infection within the premises of industrial unit and outside cannot be prevented if adequate control measures are not instituted both in the premises as well as in adjoining areas.

The microscopic examination of blood smears of fever cases, visiting the OPD of the hospital/dispensaries of industrial complexes, is done by their technicians, whose training status in malaria microscopy is often unsatisfactory and unreliable. This results in poor rate of diagnosis of malaria, thereby allowing the infection to build up among the residents of the industrial complex.

A team from the task force visited BHEL complex at Hardwar and the information made available to them by the Malaria Research Centre (Field station at Hardwar) on epidemiology and control of malaria in BHEL complex was critically analysed (as case study) and the results were used as a model for recommending control measures for industrial complexes. However, it may be emphasized that similar analyses are also required for other industrial complexes particularly in the 7 states viz. Andhra Pradesh, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Orissa and Rajasthan. The presented model provides a useful insight into the magnitude of the problem and the malariogenic potential in relation to the surrounding area. Feasibility of control measures is also briefly discussed.

Critical appraisal of malaria control operations in BHEL complex, Hardwar (A case study)

The Bharat Heavy Electricals Ltd. (BHEL), established in Hardwar in an area of 25 sq.km. housing industrial plants, residential colonies for the staff and a few unauthorized labour settlements. The residential population of BHEL is 60,000 (1991 census) with over 7000 residential quarters. Population dwelling in slums in BHEL area is about 5283 (1986 records). The entire area falls under PHC Bahadrabad including Hardwar town. Hardwar town, adjoining BHEL is spread in an area of 20 sq.km with a population of 1,47,177 (2.45 x more than BHEL). Population density in BHEL is 2400/sq.km. and in Hardwar town 7358.8/sq.km.

The BHEL have their own anti-larval squad for larval control. This service was supplemented by spray operations carried out by district authorities (NMEP). The Malaria Research Centre (MRC) established a field station in BHEL Hardwar in July 1986 and started bioenvironmental control measures thereafter. By January 1987 the entire campus was under bioenvironmental control operations including environmental modification/manipulation supported by active case detection and quick radical treatment.

Parasitological data

Comparative analysis of 4 years parasitological data (1983-1986) of BHEL and PHC Bahadrabad (including Hardwar town) revealed higher disease incidence, and intensity of P.falciparum transmission in BHEL. It is apparent from table I that though the SPR, SVR and SFR in BHEL was lower in 1984 in comparison to the adjoining area of Hardwar, the intensity of P.falciparum infection was relatively higher by 15.01% in BHEL. Thereafter all the four parasitological indices registered higher values in next 2 years in BHEL. The available data being inadequate for definitive conclusions it may however be inferred from above observations that though in 1984 the overall disease rate was lower in BHEL, the marginally higher P.falciparum transmission intensity indicates restricted/localized uninterrupted transmission focus/foci in the BHEL complex.

The MRC initiated bioenvironmental control measures in July 1986. A comparison of 5 years parasitological data (1987-1991) after the start of these measures reveals a significantly higher disease rate/parasite load and P.falciparum infection intensity in BHEL as compared to adjoining PHC Bahadrabad.

Table I. Percent higher (+) or lower (-) values of parasitological indices in BHEL in comparison to adjoining PHC Bahadrabad (Pre-MRC intervention measures)

Year	SPR	SVR	SFR	Pf%
1983	+ 19.04	+ 10.88	+ 127.27	+ 90.4
1984	- 23.13	- 25.2	- 12.02	+ 15.01
1985	+ 39.16	+ 32.5	+ 104.8	+ 45.83
1986	+ 110.8	+ 100.56	+ 431.8	+ 145.16

Table 2. Percent higher (+) values of parasitological indices in BHEL in comparison to adjoining PHC Bahadrabad (After start of MRC-bioenvironmental control)

Year	SPR	SVR	SFR	Pf%
1987	+ 181.6	+ 176.9	+ 433.3	+ 87.9
1988	+ 342.8	+ 313.4	+ 387.5	+ 16.5
1989	+ 212.5	+ 3140	+ 11900	+ 108.0
1990	+ 96.42	+ 88.38	+ 180	+ 56.3
1991	+ 144.7	+ 138.0	+ 130	+ 296

Though in BHEL there was a noticeable decline of disease incidence after the start of the bioenvironmental control measures, there has also been a more pronounced decline in malaria incidence, and intensity of P.falciparum infection in the adjoining PHC Bahadrabad, where no bioenvironmental control measures were introduced during the period.

Table 3 Comparison of parasite rate and Pf% of BHEL area with adjoining PHC Bahadrabad (Pre MRC intervention measures)

Year	SPR		Pf%	
	BHEL	PHC Bahadrabad	BHEL	PHC Bahadrabad
1983	11.50	9.66	13.10	6.88
1984	10.30	13.40	15.70	13.65
1985	15.03	10.80	14.00	9.60
1986	15.50	7.35	7.60	3.10

Table 4 Comparison of parasite rate and Pf% of BHEL area with adjoining PHC Bahadrabad (After start of MRC bioenvironmental control)

Year	SPR		Pf%	
	BHEL	PHC Bahadrabad	BHEL	PHC Bahadrabad
1987	4.0	1.42	4.04	2.15
1988	3.1	0.7	12.47	10.70
1989	5.0	1.6	2.58	1.24
1990	5.5	2.8	2.69	1.72
1991	4.7	1.92	2.96	0

From the tables 3 and 4 it is evident that after the introduction of bioenvironmental control measures in July 1986, the parasite rate among residents of BHEL was drastically brought down from 1987 onwards. The mean SPR (1983-1986) in pre-bioenvironmental measures period was 13.03 and after the introduction of bioenvironmental measures was 4.46 (1987-1991). The corresponding figures for PHC-Bahadrabad were 10.30 (1983-1986) and 1.68 (1987-1991) respectively. As the intensity of P.f infection remarkably declined after 1986 in BHEL, similar decline was noticeable in PHC-Bahadrabad. However in the year 1988 3.1X and 5.0X increase in the infection intensity was discernible in BHEL and PHC Bahadrabad respectively, as compared to the previous year 1987.

In view of above observations and preliminary analyses of available data it may be inferred that the bioenvironmental measures undertaken by MRC brought down malaria incidence in BHEL. It may also be reasonable to point out here that the reduction in disease incidence and intensity of infection/ transmission by these measures in BHEL might have contributed to a decline of malaria incidence in the adjoining areas of Hardwar town under PHC Bahadrabad.

Remarks/Recommendations

India is going through a phase of tremendous industrial revolution particularly for the economic development of tribal areas. The problems of malaria associated with industrial development have been grossly underestimated, due to lack of proper coordination between the management of industry and the state/ district health services, inadequate training of laboratory staff in the laboratories of the health care delivery systems of industrial complex and absence of an organised infrastructure to look into the magnitude of malaria problem and its control. This has resulted in absence of reliable epidemiological and entomological data in most of the industrial complexes.

Governments need to introduce legislation wherein before setting up an industrial unit the concerned health authorities need to be informed of the labour movement, constructional and all other related activities that promote mosquito breeding and increase man-vector contact to aid transmission. The district health authorities should then undertake active surveillance to prevent epidemics. Where ever industries have been established the health authorities should ensure that adequate steps are taken for the control/containment of malaria. Feasibility of bioenvironmental control measures should be worked out by entomologist, based on the analysis of entomological data of the area. Personal protection measures using bednets can also find place in control strategy for residents of industrial areas depending upon the dynamics of vector population. Intervention measures against malaria vectors in industrial complex should essentially be integrated with the control of vectors of other diseases like dengue fever, filariasis, etc. which may be more cost effective in the long run. Health education forms an important component of intervention strategy particularly when alternate methods of control are to be tried successfully.

The industries should encourage the involvement of non governmental agencies in promoting IEC in vector borne disease control activities in their area.

CHAPTER 7

REVIEW OF MALARIOGENIC STRATIFICATION

INTRODUCTION

Malaria is a focal disease and its distribution may be localised with varied intensity. Such focalisation of the disease depends on several ecological factors working in complex ways to maintain this focality.

Qualitative and quantitative factors involved in malariogenic diversity, if examined in detail wiil reveal that no two situations are exactly alike. Yet there are detectable similarities and malariologists from the beginning have tried to classify these situations into type, classes or strata for descriptions and planning control measures. Such efforts are still continuing. Such classifications typological now termed as stratification.

Sub-division of the malarious area on basis of relevant variables/factors into homogenous zones with different control strategies to be applied as a crucial step in the planning of Malaria control is called stratification. Malariogenic stratification of an area is therefore the delineation of homogenous zones having similar epidemiological, geophysical, socio-economic and ecological characteristics.

While classifying into homogenous areas factors such as urban & rural conditions, land development schemes, economic development areas, labour and military camps, industrial & project areas, areas of vector resistance to insecticide , areas of Plasmodium resistance to antimalarial drugs etc. be taken into account besides data on eco-epidemiology and entomology. The stratification tries to simplify the presentation of the malaria problem in order to facilitate the decision-making process. Within a systematic planning process, it fits naturally between the analysis of the situation and the formulation of objectives and approaches.

Stratification process is appropriate for planning control measures at Central, Intermediate and Peripheral levels. At Central level stratification will help in defining malarious area in the country and also receptive and non receptive areas in a broad way which can help in planning and allocation of available resources to priority areas. Development of mechanisms for prediction and containment of epidemics and computer models may be developed after microstratification at District/PHC level.

Previous typing of areas for specific control measures have to be kept in mind while attempting stratification at central level which has to be on general and broad-scale.

Intermediate level can be states where more detailed data be used for stratification. At state level same objectives in more defined manner can be achieved for planning, targetting, monitoring and evaluation.

It is at the peripheral level (suggested level District & PHC) that all possible local factors be considered in detail with maps and tables. It is at this level (District/PHC/Village) that maximum advantage of stratification (micro stratification) exercise can be achieved by helping micro-planning for most effective targeting of control measures.

Major steps in the process of stratification are as follows :

1. Collection of data

2. Processing data for each criterion

3. Grouping data in a matric format, each basic unit (i.e. village, workers area, PHC, District) according to its set of characteristics

4. Interpretation of data

5. Setting limits to each stratum and preparing graphic displays to express and facilitate an understanding of the overall stratification results

6. Arrange feasibility and data generating studies wherever required

Most of the data required for stratification should be generated at lowest administrative level where epidemiological and entomological expertise is also made available.

In a vast country like India, such levels are much above peripheral units which are technically required levels for such stratification. Concensus is that District/PHC should be the level for stratification and each District be provided with epidemiological and entomological expertise and help in planning, execution, monitoring and evaluation of malaria control. It is desirable that peripheral staff be involved in collection, compilation and analysis of data for stratification. Data required for epidemiological and operational stratification related to epidemiological, operational, meteorological, geographical, socio economic & ecological factors are indicated below, however for details chapter 5 may be referred.

EPIDEMIOLOGICAL

1. Endemicity levels past and present, seasonal distribution, incidence, mortality, parasite species, distribution of parasites, vector resistance, immunity levels of populations, etc.

2. Stability - data of best achievement period and resurgence period with causes, if identified.

3. Vector bionomics and ecology.

OPERATIONAL

1. Primary Health Care structure and distribution, institutions and staff required as per norms, sanctioned and in position.

2. Workers and supervisors work output for malaria control activities. Qualitative and quantitative blood slides collected in time and space, cases treated, radical treatment given etc., spraying supervision, coverage, etc.

3. Laboratory Services - Quality - discrepancy in examination, staining, record keeping. Number of blood slides examined per day, per month.

4. Drug distribution data.

5. Logistics - vehicles, insecticides, microglass slides drugs.

6. Training status of staff.

7. Constraints of implementation.

METEOROLOGICAL

Rainfall year wise, month wise for at least 10 years, number of rainy days. Excess or decrease against average rainfall, flood, drought.

- Relative humidity variations in micro & macroclimatic zones.
- Temperature variations

GEOGRAPHICAL

Geo-physical - Topography - hill, plain, foothill, with or without vegetation, rivers seasonal or perennial, water bodies dams, reservoirs, irrigation, cropping pattern, aforestation, deforestation, altitude, tides and water table, mines, projects.

SOCIO-ECONOMIC

Socio-Economic - Literacy, per-capita income, occupation, agricultural development and practices, colonisation, movement of population, housing conditions, significant cultural practices and their effect on malaria control, acceptance or resistance to malaria control activities, urbanisation, insurgency or social or political disturbance.

Peripheral staff has to be fully evolved in planning and execution of control measures with all possible support and guidance from levels above.

A micro-level planning at district level with PHC and worker areas being the smallest unit for stratification is proposed. Further village wise stratification to be attempted at District/PHC level. It is suggested that such an exercise be undertaken on priority in tribal areas, several of which can be termed as refractory to malaria control measures during eradication phase which were till date most efficient, affordable, acceptable and effective measures. What were these factors (general or local) which helped in persistance of transmission in these areas? Identification of such factor/factors will go a long way to plan strategies for control of malaria not only in these areas but for the country. Thus, the major exercise for stratification should be from below and not from above. Information on the epidemiological situation of various malarious areas at the time of greatest success, (1965-66) measures used and an analysis of data of the period of malaria resurgence and its causes may prove valuable for prevention of failures in future. Stratification requires identifying all the relevant factors affecting malaria prevalence and transmission in the area under consideration, wherever required and feasibility studies of application of proposed method be done.

SOME OF THE PAST AND PRESENT EFFORTS FOR CLASIFICATION/STRATIFICATION OF MALARIOUS AREAS

I. Qualitative Types

a. According to Climatic Zones : Cilli (1900) and Gill (1938) proposed Climatic Zonation. Gill described four zones temperate sub tropical, tropical & equatorial. It was soon realised that prediction of presence and type of Malaria in a given place cannot be explained by this method.

b. Zoo-Geographical Zonation : Macdonald (1957) divided the malarious areas into twelve zones each with its own type of malaria. It takes into account the field observations about malaria and its vectors. It is more realistic than climatic type but it also fails to predict and identify several situations particularily varied impact of effective efficient measures.

Gramacia (1953) divided Lebanon in 5 geo epidemiological zones based mainly on transmission season. Thuviaux (1971) divided Yeman Arab Republic into 4 epidemiological zones. Krauchenko (1979) divided Democratic Yeman into 5 landscape zones. Lysenco et al (1956) Tazkestan malaria foci typing and malariogenic stratification of North Vietnam; Atlas of Tanganyika & Kenya etc are other examples. Brief description of stratification attempts by Asian countries follow.

One such ecotype classification is suggested by Ministerial conference on malaria western pacific in Asia (WHO 1992). Eight types proposed are :

1. African Savanna Malaria.
2. Desert and highland - fringe malaria.
3. Malaria associated with traditional agriculture in plains and river valleys outside Africa.
4. Malaria associated with extensive agricultural development.
5. Forest related malaria.
6. Urban malaria and malaria in planned human settlements.
7. Coastal & Marsh land malaria.
8. Malaria in war zones and areas of socio political disturbances.

These were reduced to seven in proposed Global Malaria Control Strategy (WHO 1992) and shown in table on next pages. Coastal and Marsh land malaria is omitted.

Main characteristics (epidemiological and operational) with control priorities are clearily given with correct emphasis on Disease Management with selective chemoprophylaxis, general health services development, awareness and preparation against outbreaks, preventive measures (insecticidal and non insecticidal), Bioenvironmental, personal protection measures, intersectoral coordination, operational research and manpower/facilities development.

In global malaria control strategy (WHO 1992) seven types are described with their characteristics and priorities for control.

Main characteristics and control priorities in different malaria situations

Malaria Type (Main Occurrence)	Characteristics		Priorities for Control	
	Epidemiological	Operational	Disease Management	Prevention
Savanna Malaria (e.g. Africa, Papua New Guinea)	* Intense and constance transmission, but increasing seasonal variation away from equator * Morbidity and mortality concentrated in young children and pregnant women * Increasing problems of drug resistance	* Insufficient coverage of health services * Malaria control programmes most often rudimentary	* Needs expansion through formal and informal general health services. * Capacity for management of complicated malaria and treatment failures in health services must be strengthened	* Potential role of impregnated bednets and curtains must be examined from epidemiological and operational viewpoints * Chemoprophylaxis indicated for pregnant women, unless precluded by drug resistance
Malaria of Plains and Valleys outside Africa (e.g. Central America, China, Indian Subcontinent)	* Moderate, variable transmission * P.vivax may dominate * Strong seasonabl variation * Risk of epidemics	* Often large-scale house spraying programmes * Inadequate disease management in vertical programmes * Insufficient general health services, mainly private in some areas	* Responsibility for disease management should be assigned fully to general health services * Epidemiological infor- mation systems require collaboration between malaria programme, general health services and other sectors	* Reorientation for better targeting of vector control * Impregnated bednets proven useful in China * Envlronmental management possible in some areas
Highland and Desert Fringe Malaria (e.g. African and South East Asia Highlands, Sahel, Southern Africa)	* Risk of epidemics as non-Immune populations are exposed because of climatic aberrations of changing agricultural practices in normally malaria free areas or because of mignation to malarious areas	* Presence of health services variable * Preparedness for management of malaria cases may be poor in habitually malaria-free areas * Terraln, distances and precipitation may present obstacles to vector control	* Must be established rapidly with effect drugs in case of outbreak * Active detection and treatment of fever cases may be justified * Health services must be aware of risk of outbreak	* House spraying can often rapidly curb transmission and sometimes revert situation to malaria free status

Malaria Type (Main Occurrence)	Characteristics		Priorities for Control	
	Epidemiological	Operational	Disease Management	Prevention
Agricultural Development Projects (e.g. Asia, South America, Africa)	* Attraction of non-immune labourers * Irrigation increases transmission in some circumstances	* Some financial resources * Often insecticide resistance in cotton-growing areas	* Services for early treatment required	* Environmental management to be considered in planning * Siting and screening of habitations * Impregnated nets * Larvivorous fish in some rice-growing areas * House spraying or prophylaxis if needed
Urban Malaria (e.g. Africa, South America, South Asia)	* Transmission and population immunity highly variable over short distances * Epidemics caused by specially adapted vectors in South Asia	* Relatively good coverage of health services * Variety of antimalarial drugs available from different sources * High population density * Breeding sites identifiable	* Main need is often for standardization of treatment practices	* Larval control by environmental and hygienic measures. In some situations chemical larviciding * Personal protection, including improved quality of housing
Malaria of Forests and Forest Fringes (e.g. South East-Asia and South America)	* Focally intense transmission * Often occupational risk groups * Severe multi-drug resistance	* Services absent or poorly developed * Absence of social organization * Variety of drugs sold	* Facilities must be established where needed. May need to be specialized for malaria * Treatment protocols must be continually adjusted on basis of operational research	* Personal protection measures * Impregnated bednets should be investigated * House spraying and larval control useless
War Zone Malaria	* Displacement of parasite carrying or non-immune populations * Environmental degradation causing increase mosquito breeding	* Interruption of vector control operations * Breakdown of curative services, which may later be replaced by humanitarian action and sale of drugs	* Drugs for treatment and advice on their use must be provided through available channels	* Refugees and soldiers may be protected by personal protection measures and/or chemoprophylaxis * Environmental measures important for refugee camps * Space spraying may be applied for emergency situations in camps

C. Landscape Epidemiology (Lysenko and Somashko 1968 & Lysenko 1983) Main points of the approach are :

- Malaria is a focal disease
- Foci being defined as relatively self-contained units of transmission
- Malarious area such as a country/State for which malaria control has to be planned is first stratified according to its Physical & human geography
- Malaria is then investigated in individual foci representative of various strata
- Final decision about the number of strata and their delimitation is done on basis of Control measures envisaged.

Lysenko advocates detailed planning of control at the local level i.e., approach from below then build up zonations on basis of control measures. He criticised the two previous approaches which tried to develop a global zonation for description and understanding as primary to take control measures.

Two approaches can be summarised as below :

Lysenko Stratification based on appropriate control measures decided after detailed study of local malaria situation in each Foci.

Gill & Macdonald and others prescribe

Stratification first and then control measures to follow, Lysenko blamed adoption of "from above" approach for many of the failures of Malaria eradication operations.

Two approaches may be compatible in theory as data product and collection process be similar to great extent but there may exist a real antagonism between the approaches "from above" and "from below" in practice. It is suggested that micro stratification based microplanning should be the basic step towards effective long term malaria control programme planning and implementation.

II. Quantitative types

Cristopher and Pampana made "Enlarged Spleen" as a measure of malaria prevalence. After Kampala conference of WHO (1950) it was recommended as a tool for classification. Later parasite rates were combined with spleenometric indices to define degree of endemicity.

1. Levels of Endemicity - Malaria is described to be endemic when there is a measurable incidence both of cases and of natural transmission over a succession of years in an area.

Various terms have been used for denoting degrees of endemicity. Two types mostly in use are Spleenometric and Parasitologic. These are shown in following table:

S.No.	Type	Spleenometric	Parasitologic
1.	Hypoendemic	Spleen rate (2-9 yrs) 0-10% children	Parasite rate in children 2-9 yrs. 10% may be higher during part of the year
2.	Mesoendemic	Spleen rate (2-9 yrs) 11-50%	Parasite rate in children 2-9 yrs. 11-50% May be higher during part of the year
3.	Hyperendemic	Spleen rate (2-9 yrs) Constantly 50% Adult Spleen rate also high	Parasite rate in children 2-9 yrs. Constantly 50% or more ...
4.	Holoendemic	Spleen rate (2-9 yrs) Constantly over 75% adult spleen rate low Adult tolerance high	Parasite rate in upto one year age group (infants) constantly over 75%. Spleen rate high (New Guinea type) or low (African type Parasite density declining rapidly between second and fifth year of life and then move up slowly.

Above typology is criticised on following grounds :

(a) It ignores underlying factors causing malaria endemicity.
(b) It links together dissimilar situations, for example natural low incidence of malaria from low incidence brought about by malaria control measures.
(c) True parasitologic picture is often masked by widespread use of anti-malarials.

2. Stability

As far as resistance to change in a given malaria situation is concerned different situations are encountered between two extremes.

(a) At one extreme prevalence of infection is persistently high and even large natural or man made changes in the factors of transmission (e.g. vector density reduction) make little effect.

(b) At the other extreme, even small man made or natural change in the factors of transmission show profound effect in the prevalence of infection.

In between these two extremes, all possible situations will be found. Stability is directly proportional to endemicity. It increases with increase in endemicity level. Low stability areas (unstable) may face epidemics/outbreak.

Quantitatively indices for stability of an area was proposed to be spleen index and incidence of fever deaths during a number of years. However, basic reproduction rate (Macdonald) is the actual determinant of incidence, prevalence immunity and stability because it includes other three crucial variables (Vector density, duration of spraying and duration of infectivity in man). Basic reproduction rate in nature varies from Zero to several thousands. At very high levels, malaria is Holoendemic and stable. Again when basic reproduction rate is zero eg., because there is no susceptible vector the transmission of malaria is absolutely impossible. This is another type of stable malaria situation. In areas where basic reproduction rate is less than one, some transmission or even

epidemics are possible but malaria tends to disappear spontaneously. These areas are also called stable. Areas where basic reproduction rate is greater than one but not much above one unstability is maximum. If parasite is absent from such areas e.g. due to malaria eradication but vector remains, the area is said to be non-endemic but receptive. Re-introduction of parasites tends to produce epidemics followed by unstable endemic malaria.

Area can be classified on basis of basic reproduction rate as given below:

1.	Stable endemic	Basic reproduction rate much more than 1
2.	Unstable endemic	Basic reproduction rate more than 1
3.	Unstable non-endemic high receptivity	Basic reproduction rate not much more than 1
4.	Low receptivity	Basic reproduction rate much more than zero but less than 1
5.	Zero receptivity	Basic reproduction rate not much more than zero

In type 1 areas, malaria situation tends to be refractory to malaria control measures.

In 2 & 3 type areas, there is great risk of epidemics of malaria.

Type 3 & 4 are stable non-endemic. Above quantitative stratification can be useful as a tool for understanding in a general way distribution of malaria, the dynamics of its transmission, the past and expected changes in transmission made by natural and man-made changes particularly malaria control measures. Such understanding properiy applied may lead to better planning of malaria control (Moshkovsky 1967). However as direct measurement of basic reproduction rate is difficult and expensive, only research projects (like Garki) can measure it to some accuracy. But even a rough estimate obtained by indirect estimates can help.

A tentative simple classification of stability of malaria in India according to the vector species was made by MacDonald (1953). This classification assessed as stable malaria the disease carried in India by vectors A.minimus and A.fluviatilis on the other hand malaria carried by A.culcifacies, philippinensis, stephensi sundicus was considered to be unstable.

Any stratification exercise must take into account stability and endemicity. High endemicity with persistant transmission showing unresponsiviness/ refractoriness or little variation in the endemicity levels inspite of application of insecticide in efficient manner in the past qualify such areas as stable endemic. Decision to undertake anti malaria measures in such areas to be taken with great caution because under effective measures (insecticidal and others) success will reduce immunity alongwith endemicity. Thereafter any slackness or interruption of operations may cause havoc by causing outbreak/epidemics of malaria. Unless sustainability of measures is ensured it is better to leave such areas with efficient systems of treatment and management of serious cases and protection to vulnerable population e.g. pregnant women and children and non immune immigrants. In unstable receptive areas efficient mechanism of epidemic prediction, prevention and control be installed.

Any useful epidemiological stratification must combine important qualitative characteristics (as done in landscape epidemiology) with an estimation of the intensity and stability of malaria transmission locally and be flexible enough to recognize and consider dynamics of malaria bringing changes in the situation local as well as general. Changes and/or improvements in available epidemiological information must be taken into account.

MALARIOGENIC STRATIFICATION IN INDIA

Fever with malaria like symptoms is described in Atherv Veda believed to have been composed about 1500 BC. Description gives periodicity of attack of fever i.e. quotidian, tertian and quartan. It was also classified according to season of occurrence winter, summer, rainy season and said to be common where there was excessive rains or too much of grass. Areas where such fevers were common were assumed to be gandhar (Peshawar & Hati Maidan, now in Pakistan), Anga (country about Bhagalpur and Magadha (Bihar state).

Epidemiological picture in the country in 1952 described in manual of the malaria eradication operation is given below (with comments) which show that stratification at a given point of time may appear to be static but significant changes do occur whenever local factors change.

1952 situation (Mannual of Malaria Eradication)

Areas described as without malaria :

1. Areas situated at or above 6000 feet sea level.
2. North Eastern portion of the Brahmputra valley.
3. Southern most portion of the Gangetic Delta (Bengal).
4. Two areas on the eastern coast near Vishakhapatnam and around Madras city.
5. Very narrow strip on the western coast of South India.

By now in Brahmputra valley tirap Lohit and pasighat areas of Arunanchal became highly malarious API of Arunanchal in 1965 was 2.39, and in 1979 it was 71.19, 35 times increase. Area continues to be malarious till date. Reason may be opening up of the area with population movement.

Southern most portion of Gangetic Delta did show rise in endemicity (went from attack to consolidation, maintenance and back) but now again it has very low incidence.

Vishakhapatnam had severe out breaks of malaria and today active transmission is going on (industrial malaria).

Madras is contributing 50% of total cases in Tamilnadu state (Urban malaria).

On Western coast, Goa and adjoining area did have malaria problem but whole Kerala state went into maintenance.

Coastal area of Maharashtra remained hypoendemic. Now it will be interesting to watch what happens during construction of Konkan Railway.

Before launching of eradication programme in 1958 meso-endemic units were demarcated.

Classification of units was though based on endemicity some other factors vector/vectors present transmission season, geographical features, approachability of the area and previous malaria history were considered for number, duration & time of spray. Wherever transmission was perennial or where spring transmission was noticed 3rd round of spray was recommended.

In case of Rajasthan even the dose of insecticide was different. Ist round of 100 mg/sq.ft, II, III round 50 mg/sq.ft.

As the eradication programme progressed, Dr A.P. Ray in his red book made an area stratification on following lines with different timings and number of spraying rounds for each type, approchability during rains was one of the considerations:

A. Mainly hilly areas with dense forest and perennial streams and subjected to heavy rains.

B. Partly hilly with forest but not very dense though subjected to heavy rains and dotted with perennial streams.

C. Undulating areas with vegetation but not very thick.

D. All road side villages upto a depth of 5 miles and all urban areas.

During modified plan of operations (from 1977-78) provision of insecticide spraying in only those worker's areas where API was 2 or more was made. Vulnerable areas and 10 mile belt on Indo-Nepal border were kept under spraying irrespective of API.

Indepth evaluation committee of MPO under NMEP in its report in 1985 recommended "malariogenic stratification be done in the 1st six months of 1986 and based on this, a three year strategy plan of operation for malaria control must be drawn up by the end of 1986."

"Stratification to be done on the basis of operations, socio-economic and epidemiological grounds."

"A committee of experts should be constituted to work out year wise stratification of each state under existing bilateral collaboration with WHO."

"Based on stratification state plans for a period of three years must be drawn up."

As a follow up action Government of India constituted a malariogenic stratification committee which in 1986 suggested.

1. Identification of high risk, medium risk and low risk areas.

2. Spelling out measures for high risk areas on priority to achieve substantial reduction in malaria.

3. Identification of measures for control of malaria in medium & low risk areas and to prevent resurgence of the problem.

The committee recommended country wide stratification for selecting long and medium term objectives, targets and extent of specific interventions. Socio economic criteria to be also considered on priority. Main criteria to be considered were :

- Impact of malaria on health
- Present malaria status
- Response to various interventions
- Capability of health services

Committee recommended 17 factors to be considered for stratification.

1. Initial endemicity level.
2. Vector distribution original and present.
3. Possibility to interrupt transmission in respect of P.vivax and P.falciparum.
4. No. of years/rounds of spraying required to interrupt transmission.
5. Dynamics of malaria during the period of lowest incidence.
6. vulnerability.
7. Degree of re-establishment of transmission.
8. Current incidence levels.
9. Degree of potential instability.
10. Impact on health.
11. Mortality due to malaria.
12. P.falciparum resistance to drugs.
13. Transmission pattern.
14. Impact of measures on transmission for the year of maximum reduction.
15. Vector resistance by species and by group of insecticides.
16. Capability of health services.
17. Administrative support.

Above stratification was on attempt at 'Zoning' only. What to say of districts even state boundries were not demarcated. Information required under 17 factors suggested could be collected only from PHC/Districts/States without whose demarcation collection and analysis of data is not possible. Thus this exercise at stratification also from above is not practicable.

A.I. Kassatsky, M.V.V.L. Narasimham, A.S. Nair and H.L. Mankani in their paper "Malariological stratification, modalities of methodology compilation and procession data, revised these criteria reducing them to ten. They justified dropping of several criteria on the ground that they are not reflecting in the most of the cases the present pattern and features of malariogenicity in the country and incompatibility to malaria control programme objectives, and difficult to quantify. Factors dropped were :

- Initial level of endemicity,
- Original vector distribution,
- Dynamics of malaria during period of largest incidence,
- Possibility to interrupt transmission,
- Number of years/rounds of spraying required to interrupt transmission,
- Dynamics of malaria during the period of lowest incidence,
- Degree of re-establishment of transmission,
- Degree of potential instability.

However, these factors are quite relevant even in present context particularly when old intervention measures continue to be applied. For example insecticide spray, type of insecticide and doses rounds, timings, vectors targeted etc. If insecticide resistance appeared then after how much time/ rounds, reversal of resistance if any, acceptability by the people, degree of logistic, administrative and financial support for spraying (missed rounds) due to non availability of insecticide, labour etc. are also relevant in present context.

Similarily in case of drugs (same are being used) its availability, use, doses, drug failure appearance of resistance and it reversal etc. are very important.

Impact of anti-vector and anti-parasitic measures particularly its degree, duration and its variability in different situations in the past are most relevant.

Failure of basic health care services to maintain malaria free or low incidence status is said to be one of the causes for failure of malaria eradication programme. Therefore qualitative and quantitative development and effectivity of health services are relevant factors to be taken into account for stratification.

However, seven of these 17 factors are subjective in nature and their quantification for comparison is difficult.

Socio economic factors have not been taken into account.

Kassatsky et all presented a module for malagiogenic stratification where quantification of ten factors has been attempted, then went on to suggest a model for Belgaum district Karnataka State. District is stratified in five strata.

MODULE FOR MALARIOLOGICAL STRATIFICATION
A.I. KASSTSKY et al

Sl. No.	Factors	Parameters	Ranges	Weight
1.	Vulnerability	Proportion of migration/ movement to the total population	< 5% 5-15% > 15%	1.1 1.2 1.4
2.	Potential Intensity of Transmission	Highest value of API recorded during the last 7-10 years	below 2 2 - 9 10 - 29 30 - 60 > 60%	1.1 1.2 1.4 1.8 2.2
3.	Present API	Last year API	below 2 2 - 9 10 - 29 30 - 60 > 60%	1.1 1.2 1.4 1.8 2.2
4.	Landscape	Coastal Plain Undulating Plain Hills Foothills/Undulating hills		1.1 1.2 1.4 1.4 1.8
5.	Rainfall	Annual Average Rainfall	<100 cms 100-250 cms > 250 cms	1.1 1.2 1.4
6.	Abundance of Mosquito breeding places	Proportion of localities with breeding places within radius of 2 kms	< 25% 25-49% 50-75% > 75%	1.1 1.4 1.8 2.2
7.	Duration of main transmission period	Based on monthly transmission pattern as average for three years with highest level of incidence for the last 7-10 years	< 3 months 3-6 months 7-9 months > 9 months	1.2 1.4 1.6 2.2
8.	Vector efficiency	Based on "expert appraisal" of each vector in relation to the weekest one	A.stephensi A.philippinensis A.culicifacies A.belabacensis A.fluviatilis A.minimus	1.1 1.3 1.8 1.4 1.5 1.8
9.	Tribal population	Proportion to the total population	< 25% 25-50% > 50%	1.2 1.4 1.8
10.	Importance of P.falciparum	Proportion of P.falciparum [illegible]	< 10% 10-[illegible] [illegible] > [illegible]	1.2 [illegible]

Comments

1. Vulnerability

Level of infective risk due to migration/movement of population. Classes given are 5%, 5-15% and > 15%. Here movement of population has been taken as a criteria which may not give true picture of vulnerability of any area.

Vulnerable area is defined as area which lies close to malarious area or when it is liable to the frequent influx of infected individuals or groups and/or infective anopheline (WHO Tech. Report series seventeenth report).

Here it will be apt to deal with various terms being used for population movement. These are migration, immigration, emmigration, transmigration. Word 'migrate' as defined in the chambers English Dictionary is "To pass from one place to other, to change one's abode to another country, college etc., to change habitat periodically, to move to another part of the body" and migration "a change of abode, a removal from one country or climate to another esp. in a body, a number removing together. Usually the term immigration is used for incomming to an area from outside emmigration when movement is from an area to outside area. Transmigration is used in cases where population from one area goes to settle in another area (Indonesia). Term used in the paper is migration/movement. It is not made clear wheather movement is from outside to the stratum or from stratum to outside. In fact movement as such does not effect the malaria transmission in the stratum.

Thus population movement perse may not be quantified and made a basis for stratification unless screening methods can quantify the infection being introduced in the area. However intense the movement of un-infected persons may be between non malarious areas it will have little effect on malaria transmission. However, movement of non immunes to active transmission areas may give rise to outbreaks and may increase transmission and endemicity of such area. People from such area can bring back malaria infection after moving to and back from known malarious areas.

2. Potential Intensity of Transmission

Highest level of API during last 7-10 years is taken as indicator of potential intensity of transmission related to the receptivity of the area.

Argument given against taking in consideration "The initial endemicity level: is that eco-epidemiological changes since original recorded endemicity may give wrong idea of "force of infection" of the area. Drastic change in eco-epidemiological picture in UP Terai has been given as an example. However, it has been seen that such changes even drastic are reversible whether natural e.g. cycles of prolonged draught or scanty rains followed by rainy spell for few years or man made e.g. malaria control measure's success followed by failures. Deforestation followed by plantation may resume transmission and can bring back endemicity. Introduction of new potent vector may also bring reversals.

Earlier examples of areas described as non malarious in 1952 subsequent becoming malarious may be recalled.

Further, API recording is function of surveillance whose quality varies and presently is not uniform or adequate in time and space. This discrepancy is increasing, rendering comparisons faulty, (SPR can be a better indicator).

7-10 years data of API is proposed while in India even modified plan of operation is more than 14 years old.

3. Present API

As above.

4. Landscape

Five types of terrains have been given different weightage. Dr A.P. Ray classification of A,B,C,D types given earlier rightly takes into consideration vegetation and perennial riverse streams, etc. into consideration while present classification does not do so. Coastal areas with An.sundiacus as vector (Andamans) can have high transmission potential though given least weightage.

5. Rainfall

Higher average rainfall by itself may not cause more intense transmission. In fact this rainfall if mostly concentrated in a short period of time may actually reduce transmission by flushing effect on larva population. Average number of rainy days, sub soil water level, are equally important for consideration. Draught may be itself a cause of malaria transmission as in Sri Lanka epidemic due to drying river beds, formation of pools acting as breeding places.

6. Abundance of mosquito breeding places

Taking into consideration the Anopheline breeding places, instead of mosquito (which also include culicines) will be better as breeding places for both differ. In rural areas there will be very few localities without some water collection acting as breeding place for mosquitoes.

7. Duration of main transmission period

In the absence of infant parasite examination and vector disection monthly positivity is the only way to guess about transmission period. Positive slides are being reported and reflected in the month in which they are examined. It is well known that date of actual collection may be much earlier and infective bite still before. therefore, date of collection of BS be mentioned as desired to identify transmission season with some accuracy.

8. Vector efficiency

The method is said to have been evaluated after "Expert appraisal". However, different sibling species of culicifaices have different vectorial capacity and should be considered as such.

9 & 10 factors need no comment.

STRATIFICATION BY NMEP

G.P. Singh and others paper (9 June 1989) on development of a methodology for malariogenic stratification as a tool for malaria control is based mostly on Kassatsky paper reviewed above. The factors considered were reduced from 10 to 6 and with some changes and different weightages given to each. Table - I gives the details of variables, parameters, ranges and weitages.

Comments : Most of the points are covered in review of Kassatsky's paper some additional observations are as follows :

1. Topography : Irrigation factor has been considered and hills more than 3500 feet high above MST has been added. Vegetation has not been taken into account. Faulty construction and poor maintenance of irrigation system, seepage crop pattern and water table are local and more important factors than percentage of area under irrigation.

2. Rainfall as above.

3. Vector prevalent in the area : When there are more than one vectors the sum of their vectorial capacity has to be considered. However when this was done in Karnataka by adding weight of Culicifacies and fluviatalis (without knowing their proportion or working out their vectorial capacity) the resultant data did not 'Fit' well.

4. Average API for the last five years : It is well known that there are areas where either there is no surveillance or it is most inadequate in time and space. Hence areas and weightages are not comparable unless mass surveys are done in such areas to make it adequate. Further average API may give a wrong impression as made clear by following example of hypothetical data for five years API from two areas.

   Area (X) 20 + 11 + 5 + 3 + 1 = 40 Average 8
   Area (Y) 9 + 8 + 7 + 9 + 7 = 40 Average 8

   If we add to above the weightage of next variable i.e. epidemic potential taken as highest value of API during last 5 years, we come to following weightage for above areas as :

   Area (X) 8 + 8 = 16 and Area (Y) 8 + 4 = 12
   It will appear that area Y has much less endemicity than X.

5. Vulnerability : Observations already made above.

STRAFIFICATION OF KARNATAKA STATE BY NMEP

The State of Karnataka was stratified on the basis of above variables. After one year it was found that there is no close 'fit' as expected. Certain changes in weightages were made and data rechecked to get better 'Fit' for Karnataka now, to some extent in Gujarat but hardly 'Fit' for Maharashtra.

Reason is obvious. This is another attempt to get a 'fit' from above. Several factors which affect the local transmission & endemicity discussed above have not been taken into account and/or weightages given to the factors may not have the same value locally as they are arbitrary. Factors which may not be playing locally any significant part are also given weightage.

Unless stratification is done from below such exercises may not only be less fruitfull but may consume scarce resources without proportionate benefit. Now NMEP has collected data from all the PHC's and computerised it. It will be interesting to watch the progress of applicability and predictability of this model in Karnataka, Gujarat, Maharashtra, etc.

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Table 1 Quantification of variables for malariogenic stratification

S.No.	Variable	Parameters	Ranges	Weight
1.	Topography	- Foothills	-	10
		- Undulating plains and hills less than 3500 (1060 metres) feet height above MSL		6
		- Plain areas with more than 50% area under irrigation	-	5
		- Plain areas with less than 50% area under irrigation	-	3
		- Hills more than 3500 feet (1960 metres) height above MSL	-	2
		- Coastal	-	0.5
2.	Rainfall	- Average annual rainfall of last five years	300 cm and above	10
			200-299 cm	8
			150-199 cm	6
			100-149 cm	4
			50-99 cm	2
			0-49 cm	1
3.	Vectors prevalent in the area	- Efficiency of vectors in transmitting the disease based on experience of experts	A.balabacensis + A. minimus	10
			A.culcifacies + A.fluvitalis	8
			A.minimus	8
			A.fluviatilis	6
			A.sundiacus	5
			A.philippinensis	4
			A.culicifacies	4
			A.stephensi	2
4.	Average API for the last five years	-	20 and above	10
			10-19	8
			5-9	6
			2-4	4
			1	2
			Less than 1	1
5.	Epidemic potential	- The highest value of API during last 5 years	> 40	10
			20-39	8
			10-19	6
			5-9	4
			2-4	2
			Less than 2	0
6.	Vulnerability	- The migration population as percentage to the total population of the PHC	50 and above	6
			25-49	4
			10-24	2
			0-9	0

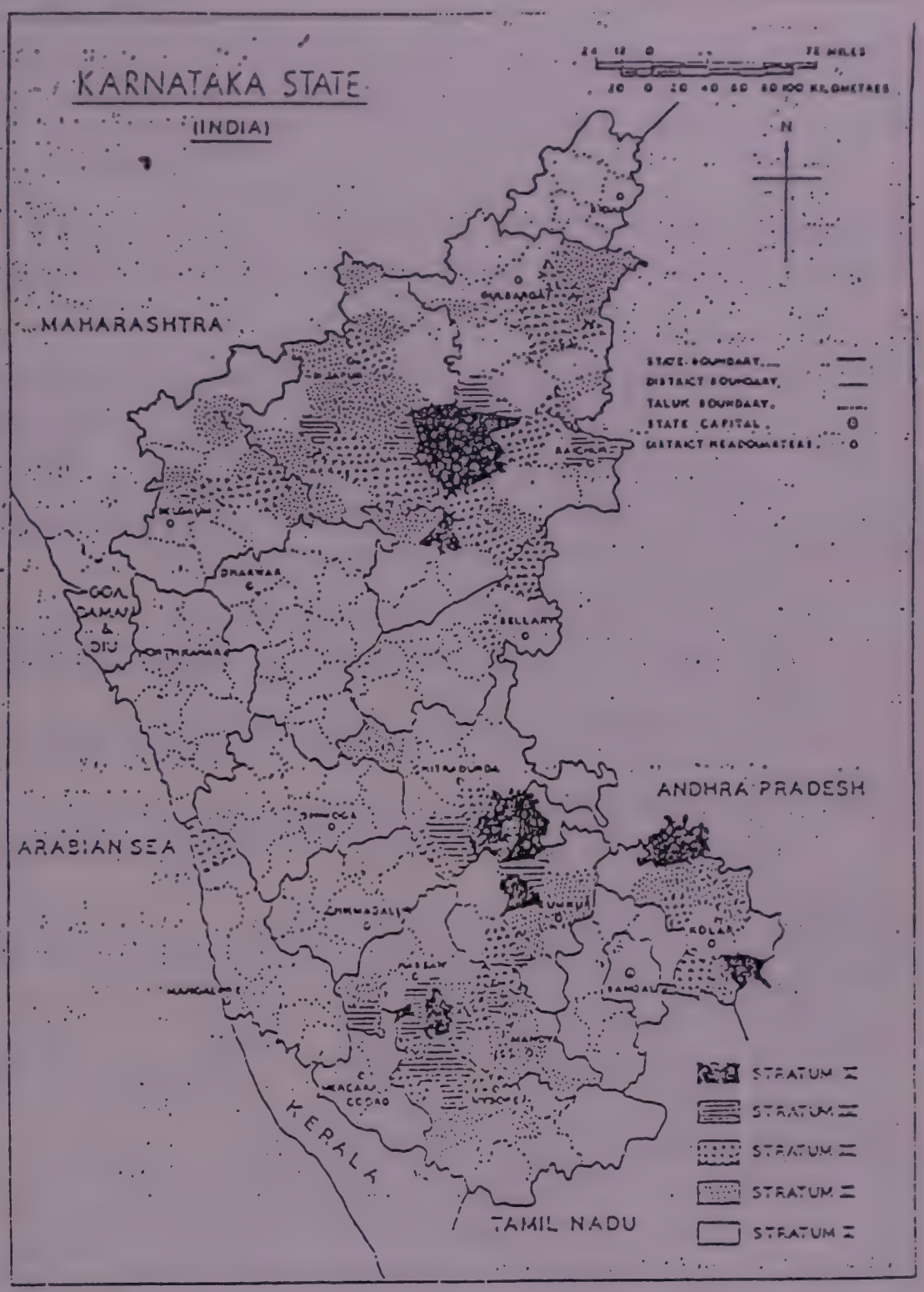


Fig. 2. Malariogenic stratification of Karnataka State based on proposed methodology

—Different strata of PHCs of Karnataka State and their malaria risk

Stratum	Cumulative weight range	Number of PHC	Malaria risk
I	0·10	269	Low malariogenic potential, low incidence and low epidemic potential
II	10.1-15	57	Low malariogenic potential, low incidence and low to moderate epidemic potential
III	15.1-20	39	Moderate malariogenic potential. Moderate to high incidence. Moderate epidemic potential
IV	20.1-25	10	High malariogenic potential Moderate to high incidence
V	25.1 and above	15	High malariogenic potential High to very high incidence

—Epidemiological behaviour of PHCs of Karnataka State falling in different strata

Variable	Criteria	Stratum									
		I		II		III		IV		V	
		No. of PHCs	% of total PHCs of the stratum	No. of PHCs	% of total PHCs of the stratum	No. of PHCs	% of total PHCs of the stratum	No. of PHCs	% of total PHCs of the stratum	No. of PHCs	% of total PHCs of the stratum
API average of last 5 years	20 & above	0	0	0	0	0	.0	0	0	4	22.22
	10-19.9	0	0	0	0	0	0	0	0	11	61.11
	5-9.9	0	0	0	0	3	7.69	13	72.22	03	16.67
	2-4.9	0	0	2	3.51	28	71.79	4	22.22	0	0
	1-1.9	2	0.74	37	04.91	6	16.38	0	0	0	0
	Less than 1	267	99.26	18	31.58	2	5.13	7	5.56	0	0
Vulnerability	Migration										
	≥50%	0	0	0	0	0	0	0	0	2	11.11
	25-49.9	1	0.37	0	0	1	2.56	0	0	2	11.11
	10-24.9	0	0	3	5.26	3	7.69	2	11.11	1	5.56
	0-9.9	268	99.63	54	94.74	35	89.74	16	88.89	13	72.22
Epidemic potential	Maximum API of last 5 years										
	≥40	0	0	0	0	0	0	0	0	9	50.00
	20.39.0	0	0	0	0	0	0	4	32.22	7	38.81
	10-19.9	0	0	0	0	9	23.08	9	50.00	2	11.00
	5-9.9	0	0	4	7.02	23	58.97	3	16.67	0	0
	2-4.9	0	0	42	73.68	6	15.38	1	5.56	0	0
	0-1.9	269	100.00	11	19.30	1	2.56	1	5.56	0	0

STRATIFICATION IN UTTAR PRADESH

In this most populous state of the country (113.6 m) MPO was launched in 1977-78 when malaria incidence was reaching its new peak. Decline in incidence was achieved for next three years. There after incidence rose again (Table). Reasons percieved were as follows :

- Financial resources could not be obtained as per increased requirements particularly for spray as per NMEP norms which states were expected to follow.

- System of districtwise allocation of funds for spray irrespective of priority due to variable incidence.

- Process of decision to withdraw spray from less priority areas was made very difficult inspite of mention of resillency in MPO. Instructions of NMEP in this regard were rigid. (Malaria & its control in India Vol.I pages 164 & 165).

- Cost of insecticides and labour almost doubled in ten years.

- This resulted in incomplete spray rounds all over the state.

In the above circumstances state took the decision in 1986 to stratify the areas on very simple factors such as :

- Past epidemiological status, vulnerability, present incidence, Pf preponderence and resistance and on the spot decision of local officers of the district (in case there was any increasing incidence or outbreak).

- Stratification exercise was done at distict/PHC level and unit taken was peripheral workers (MPO) area.

- Every year district Malaria Officers, (earlier 100% posts of DMO were made non medical and old malaria workers promoted to these posts and one post of Deputy Chief Medical Officer Malaria & Epidemic diseases created) project the areas for spray in their district plan in consultation with district and zonal officers and the same is discussed and approved at two day meeting at state HQ after review of the epidemiological data and plan submitted by the district.

- The unit area for spraying is multipurpose worker area. Wherever screening is inadequate or workers area is vaccant mass survey was proposed.

- Other measures mostly tightening of surveillance and drug availability are taken.

- This exercise is being carried out till date and every year a revised district plan prepared by district Malaria Officer and district health authorities is discussed and approved at state HQ.

- Table - 1 gives the epidemiological data from 1978-1991.

- As stated earlier the above stratification was done as an emergency measure mostly on incidence/prevellance basis (which is after all a product of all the malariogenic factors in a workers area) and mainly due to resource constraints. This effort can be taken as first most rudimentary effort in the country to do a sort of microstratification and microplanning at district level. A detailed microstratification with all relevant factors taken into account is required.

During last six years population under spray has reduced by more than 50%. District wise reduction of population under spray ranges between 15%- to 100%.

The question that what will happen if spraying is withdrawn after careful consideration has been answered by the decline in incidence as shown in the table due to better targeting of attention and efforts to high incidence areas. Only two outbreaks confined to small areas accured and promptly controlled.

The State at present is some how managing malaria as well as JE and Kalazar control within malaria budget, stagnant for more than seven years and inadequate by technical norms.

While implementing its own stratification and microplanning the state fully cooperated with MRC for developing a macro stratification.

District/PHC wise epidemiological and other available data was compiled and supplied to MRC for stratification in 1987.

Table-1 Epidemiological Data (From 1978 to 1991) U.P.

Year	Population in million	No.of blood slides examined (in lakhs)	Positives	No. of Pf cases	No. of cases given RT	ABER	API ¤	SPR	SFR
1978	95.70	95.70	350359	8472	302929	9.9	3.6	4.1	0.89
1979	98.03	79.75	149919	3355	145564	7.9	1.5	1.9	0.02
1980	100.69	92.15	182306	10571	169369	8.9	1.7	1.9	0.11
1981	104.41	89.19	175930	11211	164719	9.5	1.6	1.9	0.12
1982	105.42	74.64	170233	16307	153509	7.0	1.6	2.2	0.21
1983	108.97	90.56	285516	65915	271110	7.4	2.6	3.5	0.6
1984	114.53	91.47	419706	70563	367737	8.0	3.6	4.5	0.7
1985	117.11	87.31	373305	55010	354030	7.4	3.1	4.2	0.6
1986	119.18	78.01	228244	19994	217455	6.5	1.9	2.9	0.2
1987	120.93	79.73	125191	10495	121805	6.5	1.04	1.5	0.13
1988	122.57	94.92	135096	9919	131997	8.6	1.2	1.4	0.1
1989	124.32	96.96	101915	6617	99098	7.1	0.9	1.1	0.07
1990	127.03	93.71	103222	7945	101928	7.3	0.71	1.1	0.08
1991	129.19	91.59	106734	7721	103934	6.7	0.7	1.1	0.08

¤ National Targets - to bring down API to 1.9 in 1990 and 0.5 by the year 2000.

1989

UTTAR PRADESH

API
SPR

1991

UTTAR PRADESH

API
SPR

TABLE 1: DISTRICT WISE INFORMATION OF PARAMETERS CONSIDERED FOR AGROCLIMATIC STRATIFICATION

DISTRICT	SOIL TYPE	RELIEF m/sq	RELATIVE in sq.	GROUND WATER (sq.km/thousand)	CANAL IRRIGATED AREA IN HA.	NET IRRIGATED AREA IN HA.	TOTAL GEO. AREA IN HA.	CATTLE POPULATION	HUMAN POPULATION	RAINFALL AVERAGE IN CMS	MAX. MIN. ANN. RAIN (1976-77)
AGRA	Sub mountainous+Alluvial	<20 m	174	<50	31457	171972	491400	230077	[illegible]	74.1	15.7
ALIGARH	Sub mountainous+Alluvial	<20 m	182	50-150	58711	374361	500400	310710	[illegible]	77.7	15.48
ALLAHABAD	Sub mountainous+Alluvial	<20 m	94	>150	52114	165743	725300	724465	[illegible]	102.7	4.05
AURAIYA	Sub mountainous+Alluvial	>100 m	2000	-	1530	11835	302350	269595	[illegible]	115.44	5.2
AZAMGARH	Sub mountainous+Alluvial	<20 m	74	>150	30274	240819	534400	684257	[illegible]	120.4	0.27
BADAUN	Sub mountainous+Alluvial	<20 m	166	>150	-	208375	515200	411684	[illegible]	77.2	42.37
BALLIA	Sub mountainous+Alluvial	<20 m	128	>150	516	29544	497400	623225	[illegible]	118.6	0.5
BANDA	Black	<20 m	161	<50	28453	105675	510200	351145	[illegible]	101.34	0.41
BARABANKI	Sub mountainous+Alluvial	<20 m	122	50-150	65546	92271	744500	680916	[illegible]	98.4	7.04
BARELLY	Sub mountainous+Alluvial	<20 m	174	>150	69144	121550	442200	583759	[illegible]	111.3	0.32
BASTI	Sub mountainous+Alluvial	<20 m	67	>150	79735	157237	418500	883293	[illegible]	102.8	5.27
BIJNOR	Sub mountainous+Alluvial	<20 m	230	>150	6055	184146	730800	1217754	[illegible]	127.4	0.8
BULANDSHAR	Sub mountainous+Alluvial	<20 m	200	50-150	72072	292879	480500	825493	[illegible]	105.8	8.51
CHAMOLI	Mountainous + Red	>100 m	2000	-	551	1751	912500	235532	[illegible]	238.41	2.09
DEHRADUN	Sub mountainous+Alluvial	<20 m	664	<50	18882	22427	308500	157035	[illegible]	270.3	4.72
DEORIA	Sub mountainous+Alluvial	<20 m	78	>150	34514	215966	548000	584526	[illegible]	127.4	0.4
ETAH	Sub mountainous+Alluvial	<20 m	175	50-150	40472	207329	444700	700585	[illegible]	84.57	12.47
ETAWAH	Sub mountainous+Alluvial	<20 m	157	>150	119402	107055	488700	956274	[illegible]	96.17	15.04
FAIZABAD	Sub mountainous+Alluvial	<20 m	116	50-150	60277	177442	448700	856971	[illegible]	122.2	6.61
FARRUKHABAD	Sub mountainous+Alluvial	<20 m	157	>150	20340	156159	454700	744411	[illegible]	78.19	4.35
FATEHPUR	Sub mountainous+Alluvial	<20 m	117	>150	42150	111374	510200	1072.5	[illegible]	88.8	11.54
GARHWAL	Sub mountainous+Alluvial	>100 m	2597	<50	2451	10231	544000	351125	-	135.74	7.47
GHAZIPUR	Sub mountainous+Alluvial	<20 m	95	>150	10281	129641	330100	682850	[illegible]	101.34	0.34
GONDA	Sub mountainous+Alluvial	<20 m	90	>150	204	140877	722100	985570	[illegible]	107.2	0.27
GORAKHPUR	Sub mountainous+Alluvial	<20 m	95	>150	63697	261682	638100	770548	[illegible]	127.4	1.29
HAMIRPUR	Sub mountainous+Alluvial	<20 m	135	<50	74786	64492	711200	582746	[illegible]	109	22.11
HARDOI	Sub mountainous+Alluvial	<20 m	158	>150	58161	188176	591200	603586	[illegible]	111.3	4.74
JHANSI	Black	<20 m	135	<50	119157	129577	484900	287021	[illegible]	109	5.63
JAUNPUR	Sub mountainous+Alluvial	<20 m	161	50-150	9263	161347	409500	670567	[illegible]	102.7	0.23
JHANSI	Mountainous+Red	<20 m	242	<50	55161	78044	490200	348437	[illegible]	109	25.03
KANPUR	Sub mountainous+Alluvial	<20 m	135	>150	183382	280418	618100	77062	[illegible]	87.6	6.47
KHERI	Sub mountainous+Alluvial	<20 m	147	>150	15666	83222	768100	551604	[illegible]	117.6	1.03
LUCKNOW	Sub mountainous+Alluvial	<20 m	123	>150	47033	73705	252100	307156	[illegible]	111.3	9.41
MAINPURI	Sub mountainous+Alluvial	<20 m	167	>150	74605	209726	425100	225742	[illegible]	96.17	12.05
MATHURA	Sub mountainous+Alluvial	<20 m	165	-	123809	234870	379700	285529	[illegible]	76.59	25.19
MEERUT	Sub mountainous+Alluvial	<20 m	217	50-150	103279	221765	594400	291402	[illegible]	114.19	15.37
MIRZAPUR	Mountainous+Red	20-100 m	153	<50	78855	108329	1170100	988370	[illegible]	101.34	9.41
MORADABAD	Sub mountainous+Alluvial	<20 m	212	>150	-	-	594000	517202	[illegible]	105.5	7.78
MUZAFFAR NGR	Sub mountainous+Alluvial	<20 m	246	50-150	175210	221963	480500	324297	[illegible]	118.46	17.11
NAINITAL	Sub mountainous+Alluvial	>100 m	1727	50-150	69172	104337	679500	271765	[illegible]	135.94	25.35
PILIBHIT	Sub mountainous+Alluvial	>100 m	186	>150	47113	106730	230400	210556	[illegible]	150.5	3.45
PITHORAGARH	Sub mountainous+Alluvial	<20 m	2000	<50	-	6525	721700	306377	[illegible]	135.94	6.61
PRATAPGARH	Sub mountainous+Alluvial	<20 m	111	>150	42414	101443	373000	547755	[illegible]	102.7	3.7
RAE BARELI	Sub mountainous+Alluvial	<20 m	179	50-150	72267	130649	440300	629030	[illegible]	88.6	3.34
RAMPUR	Sub mountainous+Alluvial	<20 m	138	>150	25977	101469	237200	153726	[illegible]	109.5	8.3
SAHARANPUR	Sub mountainous+Alluvial	<20 m	270	50-150	65050	232416	512900	484585	[illegible]	116.46	13.45
SHAHJAHANPUR	Sub mountainous+Alluvial	<20 m	166	>150	55705	104380	436100	375433	[illegible]	109.8	17.17
SITAPUR	Sub mountainous+Alluvial	<20 m	93	>150	53231	120725	573800	791677	[illegible]	117.6	0.12
SULTANPUR	Sub mountainous+Alluvial	<20 m	93	50-150	42746	129797	442400	618505	[illegible]	102.7	3.34
TEHRI	Sub mountainous+Alluvial	>100 m	2597	-	354	10285	442100	103532	[illegible]	238.81	0.75
UNNAO	Sub mountainous+Alluvial	<20 m	138	50-150	66366	123647	456800	633750	[illegible]	87.7	2.1
UTTAR KASHI	Mountainous+Red	>100 m	6315	-	1074	4934	691600	103347	[illegible]	238.81	2.33
VARANASI	Sub mountainous+Alluvial	<20 m	94	>150	75642	177873	509100	654737	[illegible]	101.34	0.52

*Source : Indian Agricultural Statistics Vol II 1976-1977 to 1976-1977.

A Technique Developed for malariogenic stratification
By Malaria Research Centre

The methodology development was gradually improved and modified and finally it was designed to be conducted in following five stages:

STAGE I	:	assessment of breeding index of MOSQUITOES and VECTOR and total breeding potential on the basis of ecological parameters.
STAGE II	:	estimation of relative VECTORIAL CAPACITY.
STAGE III	:	estimation of MALARIOGENIC POTENTIAL or resultant malaria situation.
STAGE IV	:	selection of INTERVENTION MEASURES.
STAGE V	:	estimation of PERIOD and POSSIBILITY of SPRING and MONSOON TRANSMISSION for organising implementation schedule.

STAGE I : Assessment of mosquito and vector breeding index.

The ecological parameters were categorised in two heads STABLE and USTABLE. The parameters those remain almost constant in the domain of time were considered STABLe e.g. soil type, relief, altitude etc. while rainfall, cattle and human population, temperature, relative humidity etc. as UNSTABLE. On the basis of area under canal irrigation, total irrigation and gross geographical area breeding, index of MOSQUITOES and VECTORS were estimated with the help of following formula and are given in figures on pages 112-114.

i) Mosquitogenic breeding index $= \dfrac{\text{Total irrigated area}}{\text{Gross geographical area}} \times 100 \ldots\ldots(1)$

ii) Vector breeding index $= \dfrac{\text{Canal irrigated area}}{\text{Gross geographical area}} \times 100 \ldots\ldots(2)$

Each ecological parameter was divided in three categories or more and values were assigned on the basis of their association with malaria incidence, higher values were given to the category providing more favourable condition for malaria (Table 2). The two breeding indices MOSQUITOGENIC and VECTOR were considered STABLE and UNSTABLE respectively. Total breeding potential was estimated as the total sum values of all ecological parameters and mosquito and breeding indices.

STAGE II : Estimation of relative vectorial capacity.

Vectorial capacity for each district was calculated using Garret Jones formula (Garret; 1964) given below :

$$C = m\ a^2\ p^n\ /\ (-\log_e p), \qquad \ldots\ldots(3)$$

where p - probability of survival, n - incubation period of parasite in mosquito, m - mosquito density per human, a - biting habit.

i) Mosquito density per man 'm' : In want of actual data on mosquito density in relation to man, the total breeding potential estimated in Stage I was taken as 'm' (Table 3 & 4).

ii) Biting habit 'a' : The biting habit, which is defined as the ratio of human blood index (HBI) and gonotropic cycle. i.e.,

$$a = \text{HBI/GONOTROPIC CYCLE} \quad \ldots\ldots(4)$$

was estimated assuming HBI as the product of cattle and human populations ratio and host preference i.e.

$$\text{HBI} = (\text{HUMAN \& CATTLE RATIO}) \times \text{HOST PREFERENCE} \quad \ldots\ldots(5)$$

which gave

$$\text{HOST PREFERENCE} = \text{HBI}/(\text{HUMAN \& CATTLE RATIO}) \quad \ldots\ldots(6)$$

A.culcifacies has been reported as prevalent vector species throughout the state and is apparently solely responsible for transmitting malaria in the entire rural area. Recent study (Subbarao et al. 1988) has shown the sibling sp.B of A.culicifacies to be predominent in north-eastern parts of U.P. and in Jhansi A.culicifacies is reported to be composed of sibling sp. C and D both. The vector of hilly area is A.fluviatilis with a small overlapping zone of A.fluviatilis and A.culicifacies in foot hill region. On the basis of information that was available on vector distribution Uttar Pradesh was stratified in three zones using political boundaries though these may be little different from actual vector distribution boundaries. Since HBI data is available only for a few districts one district in each zone was selected with known HBI from (Joshi et al. 1989) and within each zone host preference of species was assumed to be the same. On the basis of varying ratio of cattle and human population (Table 1), HBI and in turn 'a' was estimated for each district, assuming gonotropic cycle as 2 (Table 4).

iii) Longevity, Survival probability and incubation period :

For estimation of longevity the following regression equation was formulated using the graph on logevity of A.culcifacies in relation to monthly changes in mean temperature and humidity given in Russel and Rao (1942).

$$Y = 4.76 - 1.156\ X_1 + 0.662\ X_2 ,$$

where Y is the longevity at the temperature X_1 and humidity X_2.

Using the value of longevity, probability of survival was calculated as :

$$p = \exp(-1/\text{longevity}) \quad \ldots\ldots(7)$$

Duration of extrinsic cycle was estimated with the help of the table on sporogony in the anopheles mosquitoes at various temperature WHO (1975). Average temperature and relative humidity of transmission period was used in estimation of these parameters. The values are reported in table 4.

The estimated values of 'm', 'p', 'n' and 'a' were used for estimation of so called relative vectorial capacity as it reveals therelative trend of vectorial capacity rather than the actual values (Table 4).

STAGE III : Ecological assessment of malariogenic potential

With a view to incorporate influence of ecological parameters and parasitic load in the community, assessment of malariogenic potential was done using vectorial capacity as estimated in stage II and maximum API (NMEP data from 1976-85) of the districts in ten years (Fig.4). Vectorial capacity and maximum API was divided in three categories i.e. low, medium and high values 1, 2 and 3 were assigned to each category of VC and API finally the resultant low, demium and high strata were separated by adding these assigned values for each strata (Fig.6) which is even true if added districtwise.

STAGE IV : Selection of intervention measures

Evaluation of malaria potential lead to the selection of situation specific control strategy as only high transmission potential area may only require focal spray etc.

STAGE V : Duration and possibility of transmission

Data of 14 meteorological stations of Uttar Pradesh of twenty years for monthly average of temperature and relative humidity (RH) was plotted against months. Districts adjoining to these 14 districts were assumed to have similar temperature and humidity profile. Assuming that below 16 deg. C and 55% RH transmission is unlikely to take place, duration of protected/unprotected period from malaria and possibility and duration of spring and monsoon transmission have been worked out for each district. With the help of this and the resultant malaria potential estimated in STAGE III malaria situation was estimated more precisely for each district and intervention measures were spelled out.

Table 2 : POINT VALUES ASSIGNED TO VARIOUS CATEGORIES OF PARAMETERS CONSIDERED FOR STRATIFICATION

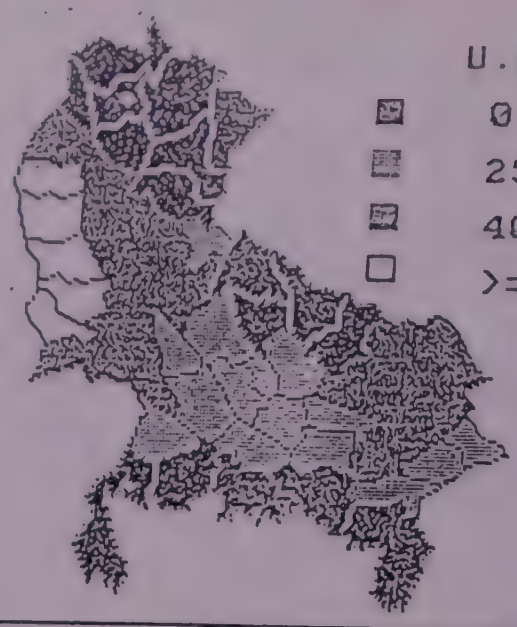
	STAGE I	(INDEX 1-5)
1.	Soil Type	
	Mountainous + Red	1
	Sub Mountainous + Alluvial	3
	Black	5
2.	Relief	
	< 20 m	5
	20 - 100 m	3
	> 100 m	1
3.	Altitude (MSL)	
	< 300 m	5
	300-1000 m	3
	1000-2000 m	1
	> 2000 m	0 (to be multiplied)
4.	Ground Water (Cu m/hr)	
	< 50	1
	50 - 150	3
	> 150	5
5.	Mosquito Breeding Index	
	< 25%	1
	25 - 40%	3
	40 - 60%	5
	> 60%	7
		(INDEX 1-10)
1.	Rainfall (Cms)	
	< 80	4
	80 - 120	10
	120 - 150	6
	> 150	4
2.	Vector Breeding Index	
	< 5%	3
	5 - 10%	6
	> 10%	10

TABLE 3: DISTRICTWISE PARAMETRIC POINT VALUES OF STABLE AND UNSTABLE PARAMETERS

DISTRICT	PERMANENT				SEMI-PERMANENT			GRAND TOTAL
	SOIL TYPE	RELIEF m/Km	ALTITUDE in mt.	GROUND WATER cu.m./h	MOSQUITO BREEDING INDEX	RAINFALL IN cms	VECTOR BREEDING INDEX	
AGRA	3	5	3	1	5	4	10	31
ALIGARH	3	5	3	3	7	4	10	35
ALLAHABAD	3	5	5	5	1	6	6	31
ALMORA	3	1	0	1	1	10	3	0
AZAMGARH	3	5	5	5	5	10	6	39
BADAUN	3	5	3	5	5	4	6	31
BAHRAICH	3	5	5	5	1	6	3	28
BALLIA	3	5	5	1	3	6	4	29
BANDA	5	5	5	1	1	6	10	33
BARABANKI	3	5	5	3	3	6	10	35
BARELLY	3	5	3	5	5	6	10	37
BASTI	3	5	5	5	5	10	3	36
BIJNOR	3	5	3	5	5	6	10	37
BULANDSHAR	3	5	3	3	7	4	10	35
CHAMOLI	1	1	0	1	1	4	3	0
DEHRADUN	3	5	3	1	1	4	3	20
DEORIA	3	5	5	5	5	10	10	43
ETAH	3	5	3	3	5	4	10	33
ETAWAH	3	5	3	5	5	4	10	35
FAIZABAD	3	5	5	3	5	10	10	41
FARUKHABAD	3	5	3	5	3	4	6	29
FATHPUR	3	5	5	5	3	6	10	37
GARHWAL	3	1	0	1	1	10	3	20
GHAZIPUR	3	5	5	5	3	6	6	33
GONDA	3	5	5	5	1	10	3	32
GORAKHPUR	3	5	5	5	5	10	10	43
HAMIRPUR	3	5	5	1	1	6	10	31
HARDOI	3	5	5	5	3	6	10	35
JALAUN	3	5	5	1	3	6	10	33
JAUNPUR	3	5	5	3	5	6	3	30
JHANSI	3	5	3	1	1	6	6	23
KANPUR	3	5	5	5	3	6	10	37
KHERI	3	5	5	5	1	6	3	28
LUCKNOW	3	5	5	5	3	6	10	37
MAINPURI	3	5	3	5	5	4	10	35
MATHURA	3	5	3	1	7	4	10	33
MEERUT	3	5	3	3	7	6	10	37
MIRZAPUR	1	3	3	1	1	6	6	21
MORADABAD	3	5	3	5	5	6	6	33
MUZAFFAR NGR	3	5	3	3	7	6	10	37
NAINITAL	3	1	1	3	1	10	10	29
PILIBHIT	3	1	3	5	3	6	10	31
PITHORAGARH	3	5	0	1	1	10	3	0
PRATAPGARH	3	5	5	5	3	6	10	37
RAE BARELI	3	5	5	3	3	6	10	35
RAMPUR	3	5	5	5	5	6	10	39
SAHARANPUR	3	5	3	3	5	6	10	35
SHAHJHANPUR	3	5	3	5	5	6	10	37
SITAPUR	3	5	5	5	1	6	10	35
SULTANPUR	3	5	5	3	3	6	10	35
TEHRI	3	1	0	1	1	4	3	0
UNNAO	3	5	5	3	3	6	10	35
UTTAR KASHI	1	1	0	1	1	4	3	0
VARANASI	3	5	5	5	3	6	10	37

Table 4: Districtwise vectorial capacity estimates

District	Breeding Index	Biting Habit	Probability of Survival	Incubation Period	Longevity	Vectorial Capacity
AGRA	31	.020351	.95	7.5	10.15	.1506123
ALIGARH	35	.013773	.94	6.5	17.2	7.630087E-02
ALLAHABAD	31	.00639	.95	6.5	21.68	1.966193E-02
ALMORA	0	.177024	.98	47	42.06	0
AZAMGARH	39	.00128	.96	6.5	25.59	1.254050E-03
BADAUN	31	.007984	.94	6.5	17.2	2.273329E-02
BAHRAICH	28	.000031	.92	6.5	12.07	1.357339E-04
BALLIA	29	.0015	.96	6.5	25.57	.0012796
BANDA	33	.00349	.96	6.5	22.99	7.087069E-03
BARABANKI	35	.001136	.96	6.5	23.74	8.223721E-04
BAREILLY	37	8.531001E-03	.95	6.5	17.74	3.422621E-02
BASTI	36	.001143	.96	6.5	23.76	8.570463E-04
BIJNOR	37	.000278	.96	7.5	21.82	4.073253E-02
BULANDSHAHR	35	.011002	.94	6.5	17.2	5.684600E-02
CHAMOLI	0	.120385	.98	47	42.06	0
DEHRADUN	20	.327167	.96	10	20.01	39.06524
DEORIA	43	.001867	.96	6.5	23.76	2.731282E-03
ETAH	33	.012481	.95	7.5	10.15	6.350624E-02
ETAWAH	35	.011123	.96	6.5	25.74	8.540371E-02
FAIZABAD	41	.001133	.96	6.5	25.59	1.032944E-03
FARUKHABAD	29	.010089	.96	6.5	25.74	5.027277E-02
FATEHPUR	37	.000755	.96	6.5	22.99	5.000529E-02
GARHWAL	0	.140872	.98	47	42.06	0
GHAZIPUR	33	.001116	.96	6.5	25.57	8.060017E-04
GONDA	32	.000642	.96	6.5	25.59	4.452535E-04
GORAKHPUR	43	.001422	.96	6.5	23.76	1.584444E-03
HAMIRPUR	31	.004064	.95	6.5	19.16	7.020500E-03
HARDOI	35	.005494	.96	6.5	23.74	1.923406E-02
JALAUN	35	.006405	.95	6.5	19.16	1.971005E-02
JAUNPUR	30	.001236	.95	6.5	21.68	7.119031E-04
JHANSI	23	.004013	.95	6.5	19.16	7.31406E-03
KANPUR	37	.000211	.95	6.5	21.69	4.474147
KHERI	28	.001078	.92	6.5	12.07	2.204146E-04
LUCKNOW	37	.002156	.96	6.5	23.74	3.131431E-03
MAINPURI	35	.012137	.96	6.5	25.74	.1017799
MATHURA	33	.012795	.95	7.5	10.15	6.674184E-02
MEERUT	37	.014999	.96	10	20.01	.1550072
MIRZAPUR	21	.003678	.96	6.5	25.57	5.571042E-03
MORADABAD	33	.000766	.95	6.5	17.74	3.223101E-02
MUZAFFAR NAGAR	37	.012251	.96	10	20.01	.1034118
NAINITAL	29	.234624	.98	47	42.06	26.47400;
PILIBHIT	31	.007066	.95	6.5	17.74	.0243796
PITHORAGARH	0	.044979	.98	47	42.06	0
PRATAPGARH	37	.004914	.95	6.5	21.68	1.307025E-02
RAE BARELI	35	.003361	.96	6.5	22.99	6.97119E-03
RAMPUR	39	.009723	.95	6.5	17.74	4.606216E-02
SAHARANPUR	35	8.5659995-03	.96	10	20.01	.0470244
SHAHJAHANPUR	37	.007216	.95	6.5	17.74	2.440792E-02
SITAPUR	35	.000801	.92	6.5	12.07	1.576302E-04
SULTANPUR	35	.005157	.95	6.5	21.68	1.445056E-02
TEHRI	0	.400749	.98	37	44.0	0
UNNAO	35	.000911	.95	6.5	21.69	4.5[illegible]065E-04
UTTAR KASHI	0	.14960	.98	37	44.0	0
VARANASI	37	.001452	.96	6.5	25.57	1.529779E-03



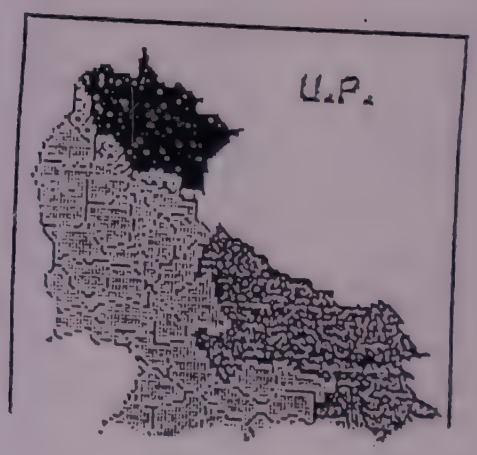
BITING HABIT

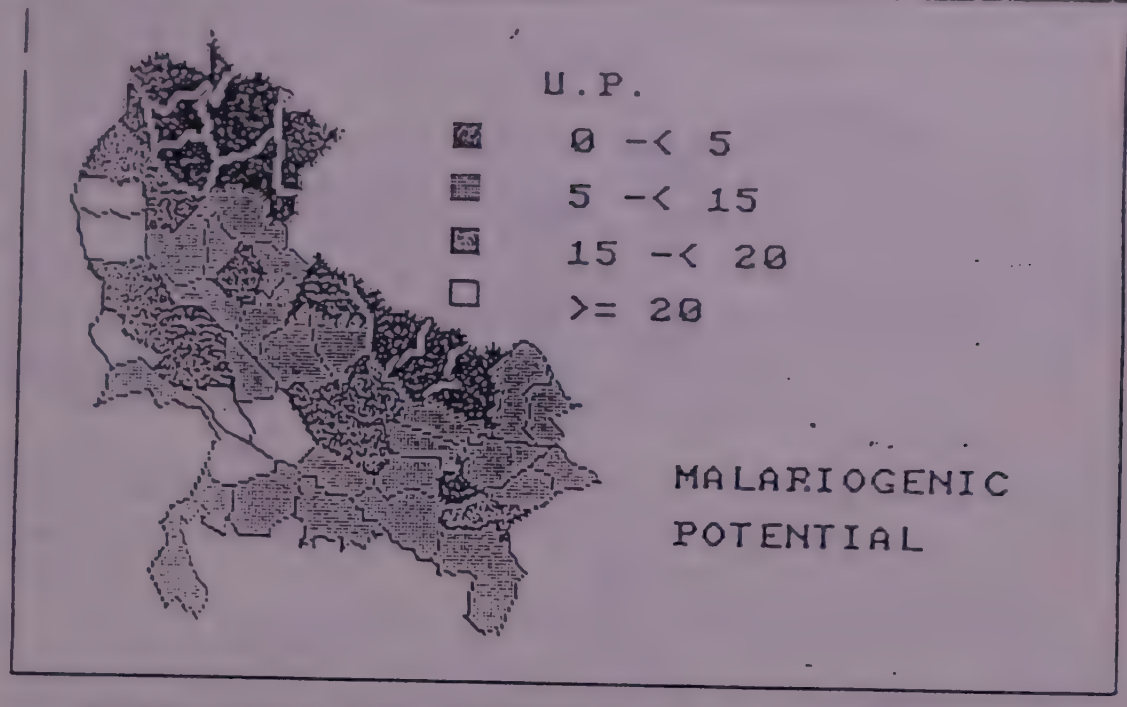
A= HBI/GONOTROPIC CYCLE

HBI=HUMAN & CATTLE RATIO
X HOST PREFERENCE

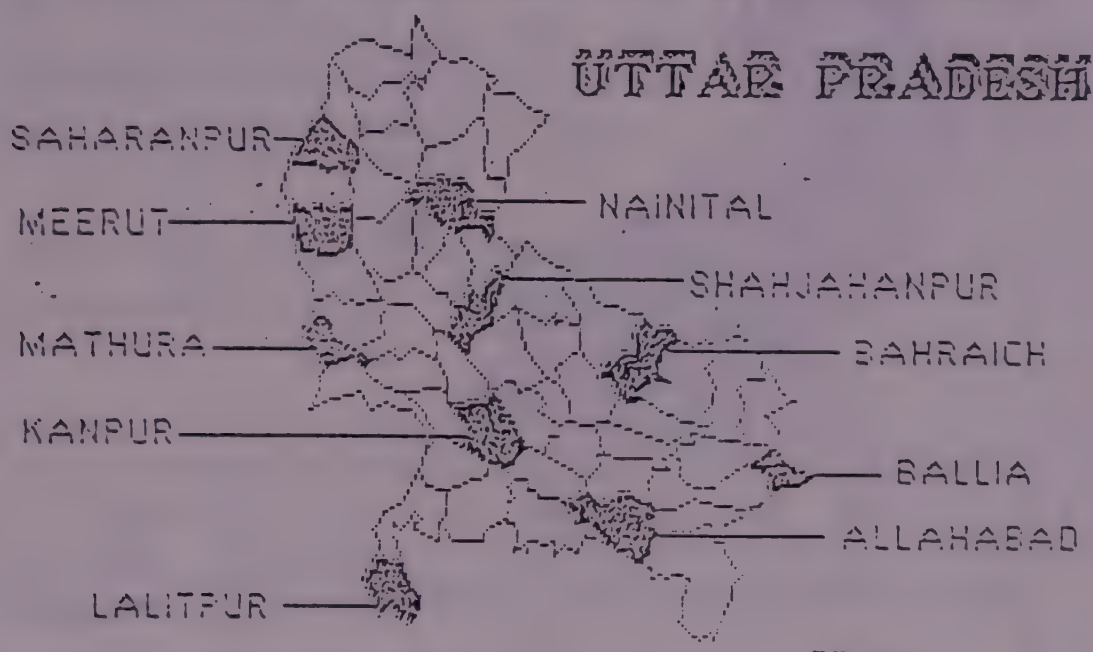
HOST PREFERENCE

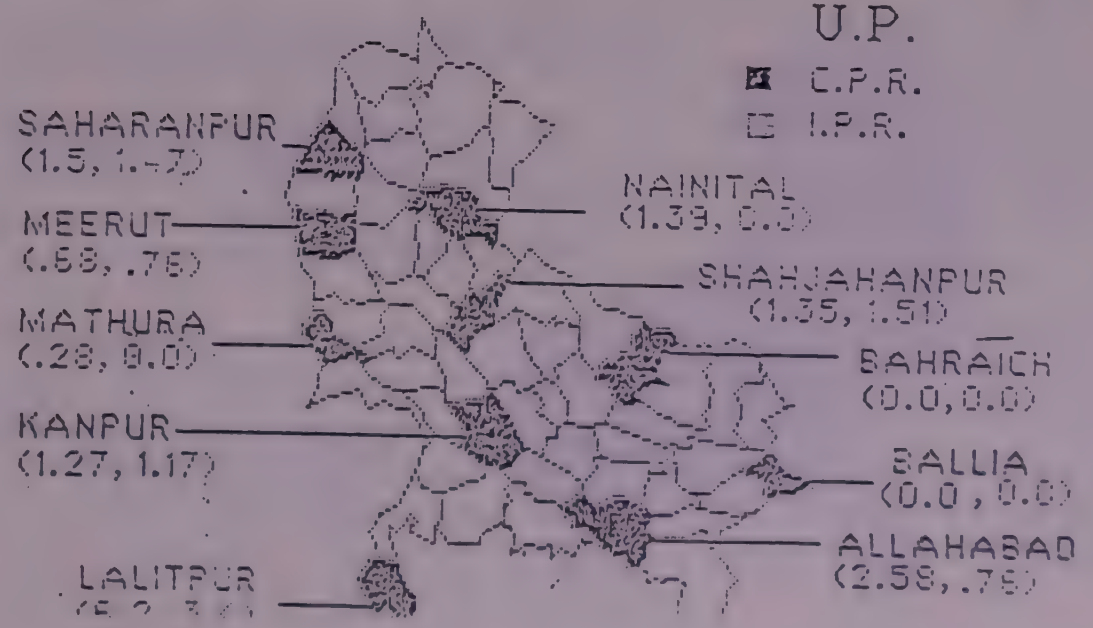
= HBI/HUMAN & CATTLE RATIO

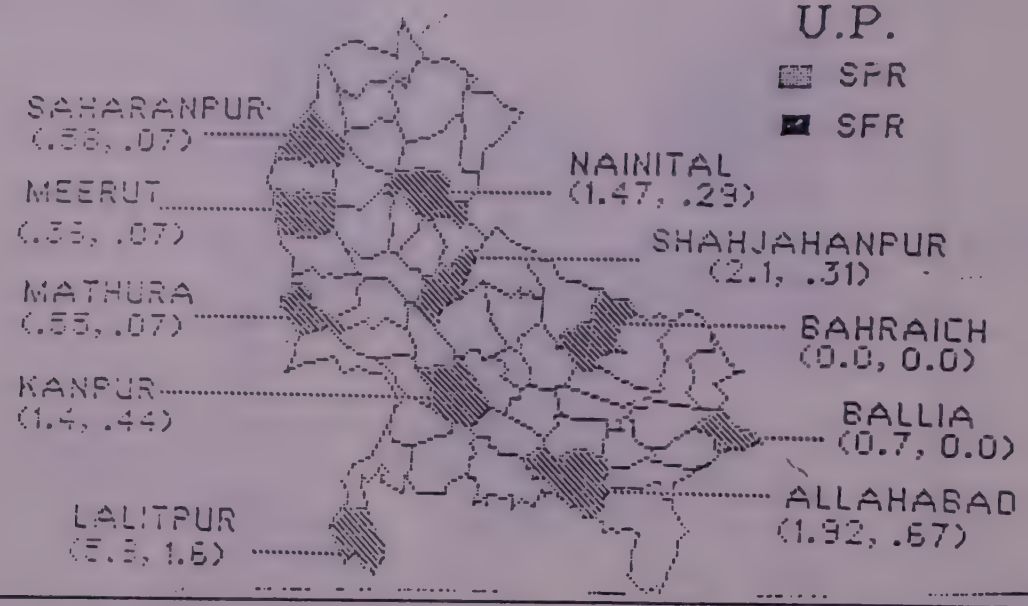


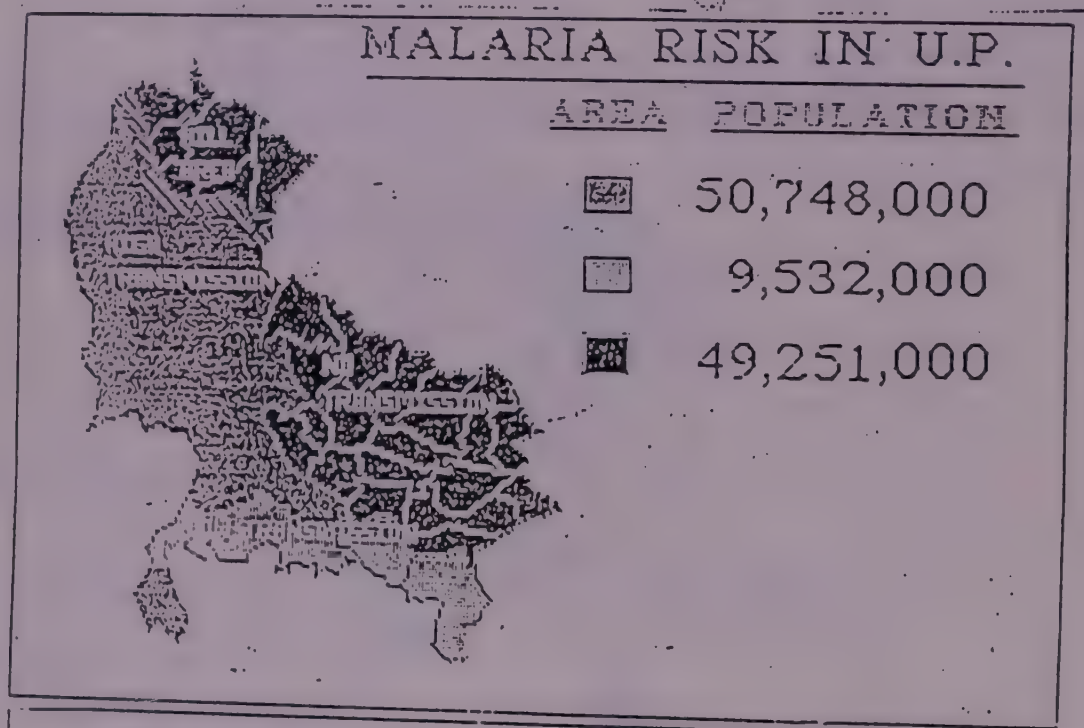


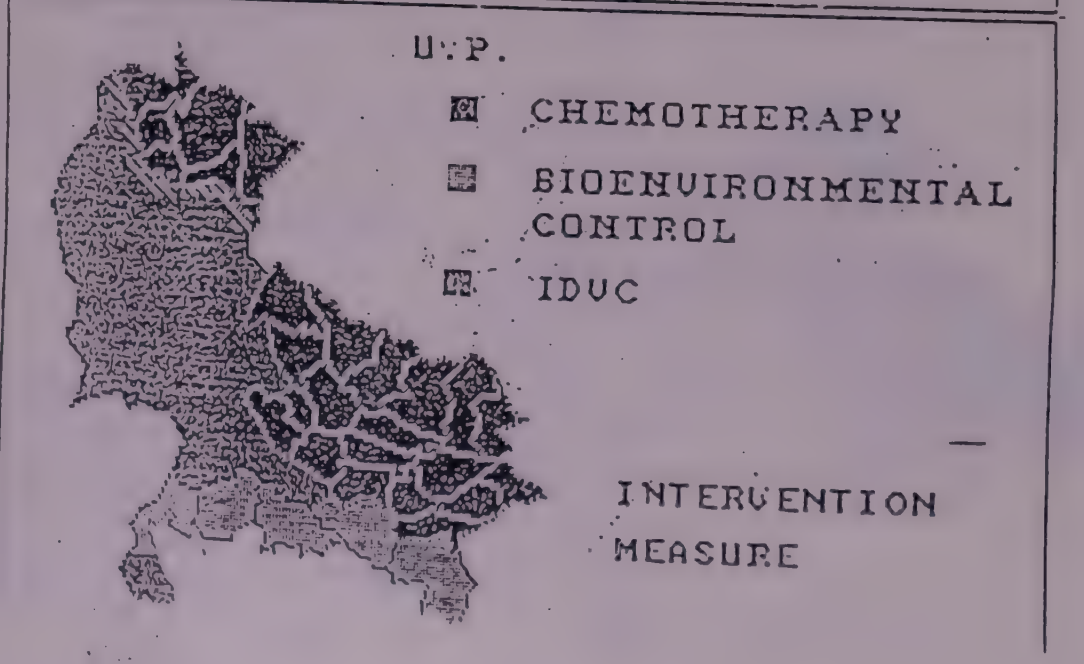
DISTRICTS SELECTED FOR SPOT SURVEYS






U.P.
SFR
SFR
SAHARANPUR
(.56, .07)
MEERUT
(.35, .07)
MATHURA
(.55, .07)
KANPUR
(1.4, .44)
LALITPUR
(E.3, 1.6)
NAINITAL
(1.47, .29)
SHAHJAHANPUR
(2.1, .31)
BAHRAICH
(0.0, 0.0)
BALLIA
(0.7, 0.0)
ALLAHABAD
(1.92, .67)


MALARIA RISK IN U.P.
AREA
POPULATION
50,748,000
9,532,000
49,251,000


U.P.
CHEMOTHERAPY
BIOENVIRONMENTAL CONTROL
IDUC
INTERVENTION MEASURE

Comments

MRC had initially developed this digitization Technique after preliminary studies in Sholapur and Thana (Maharashtra) and Kheda in Gujarat.

UP was taken as a case study for testing this digitation technique . Thus there has been no attempt to develop and implement during last five years stratification model for UP beyond a trial to 'Fit' above stratification model to each district of UP after some field studies and processing of data large volume of data was supplied by the state and computerized. Recommendations of Anti malaria measures in each district based on intensity and timing of transmission stability etc. have been made with the objectives.

1. To delineate homogenous zones of UP state having similar epidemiological, geographical and epidemiological characteristics.

2. To define specific objectives and target for each stratum.

3. To select intervention measures for the objectives and targets set.

Three zones of transmission potential emerged by this technique and are claimed to match to a great extent with the epidemiological picture (1976-85), help in forecasting malaria situation due to change in unstable ecological parameters and formulating intervention strategy well in advance in a cost effective way.

Assessment in majority of Districts is correct but not 87% as claimed. If vectorial capacity, as worked out is considered there are further more variations in expected and actual incidence.

MRC has very rightly suggested microstratification in some districts. However, it has to be done in every district and at PHC level to get maximum benefit and not in some districts only as suggested. Methodology may require further improvement, modifications based on further studies to develop stratification model for UP.

COMMENTS ON PARAMETERS AND METHODOLOGY

It has been said that ground water data was not available hence ground water yield cu.mm per hr. has been considered. Water yield will depend on type of Aquifer, impervious layers, depth, efficiency of pump etc. and is directly related to ground water to some extent only.

Equating percentage of total irrigated area to mosquitogenic breeding index and canal irrigated area to vector breeding index may not be totally applicable in well developed canal system where care for seepage etc. has been taken and in areas with dry climate, where due to rapid evaporation mosquitogenic effect of irrigation is confined to small areas near canal. Crop types and agricultural practices are more relevant. District is too big an area to be designated these values which may be valid in small areas only.

This becomes more important when these values of total breeding potential are substituted in calculating vectorial capacity for 'm' in Garretjones formula "for want of actual data on mosquito density in relation to man."

Assumption of HBI as the product of cattle and human population ratio and host preference should be verified by carefull experiments and testing in the field. Taking cattle human population ratio having a uniform distribution in a vast area like district & zone and taking this ratio as unchangeable may not be entirely correct. Overall the stratification attempt by MRC is very impressive but does not 'FIT' well in several districts.

Effect of local factors such as vector breeding places effect of movement of population on malaria dynamics quality of local anti malaria operations and management etc. may be responsible for variations from expected results only microstratification at District/PHC and even village level based on detailed studies can provide a working model.

Future Prospects

Government of India has ordered field studies in 84 districts of seven tribal states to collect relevant entomological, ecological, epidemiological and socio-economic data.

These data will help in microstratification based planning for long term malaria control in tribal areas. Same is suggested for entire country.

Collection of appropriate information should be as much detailed as possible in volume and details. Final stratification may be using part of this data. In case proposed measures are not effective to expected extent another look at available information may point out to some factor not considered but playing its part.

Peripheral staff be fully evolved in collection and analysis of Data. This will be a part of their practical training and help them in planning implementation, monitoring and evaluation of the control programme.

Recommendations

- The Task Force recommends stratification followed by microplanning should form the sheet anchor of future malaria control planning.
- Suggested level for such exercise is District/PHC.
- Exercise be done by the District/State authorities with active help and guidance of centre and national and international agencies/experts with field experience.
- It is an ongoing process hence a cell may be created at NMEP HQ exclusively for stratification and microplanning.
- Based on decentralised district microplan for malaria control, data can be pooled and areas stratified after proper analysis using advanced biostatistical tools.

Stratification based on epidemiological types

Stratification of the malaria problem, nor only in epidemiological terms but also with regard to the opportunities for intervention, shall contribute to improve effectiveness of control and the rational use of resources. This process will permit the identification of problems and constraints responsible for the slow progress fo malaria control and, therefore, the definition of priority areas. Particular areas of intense problems, and where preventive measures may be promoted and supported, include forests, forested foorhills and hills, forest fringe areas developmental project - agricultgure, mining, construction of dams, irrigation and roads, periurban areas, particularly those of intense growth.

Particular population groups incloude (a) infants, oung children and pregnant women in all endemic areas (b) mobile population groups, particularly those engaged in forest related economic activities, gem mining, fishing, industrial and road construction work and the like; (c) ethnic minorities, refugees, displaced persons, travellers and pilgrims, which constitute high risk groups.

An inititial step in stratification may be identification of major epidemiolgical types (cf. Global Malaria Control Strategy), which provides a notion of whether long term transmission control is possible or not, and which kinds of transmission control should be considered, if any.

The selection of specific measures for prevention in a particular situation requires careful consideration of the local epidemiological of the disease, as most of them have very restricted conditions of applicability. Moreover, sustainability is not so much dependent on themeasure itself, as on the way it is promoted and applied and the perception that people have of its usefulness. Even if a certain method might be technically sound in a given area, lack of infreastructure may make it impossible to solve the logistical problems efficiently; if the funding cannot be progressively assumed by local or national sources, sustainability is unlikely; if the qualified manpower necessary for sound technical management is not present, it must be developed.

CHAPTER 8

CRITIQUE ON NATIONAL MALARIA ERADICATION PROGRAMME (NMEP)

The National Malaria Control Programme (NMCP) was launched in 1953 was based mainly on vector control by use of insecticides. During the five years (1953-58) of the programme spectacular results were achieved which is evident from the following epidemiological picture.

	1953-54	1957-58	Reduction
Child Spleen Rate	15.7%	4.2%	73%
Child Parasite Rate	3.9%	0.8%	80%
Infant Parasite Rate	1.6%	0.6%	62.5%

Thus when the national malaria eradication programme (NMEP) took over in 1958 the infection load was already reduced substantially in areas covered under NMCP (mostly in high endemic areas including areas later called as hard core areas).

During NMCP all the control units could not be started in the beginning but were opened in phased manner as the programme progressed (90 in 53-54, 46 in 54-55, 26 in 55-56, Total 162). Some of the NMCP units had worked for hardly two years before being taken over by NMEP.

Consequent to the decision taken at the eight world health assembly (1955) National Malaria Eradication was launched in 1958 initially with full determination and support of the Govt. The eradication of Malaria was hopefully to be achieved within a decade. The programme did show spectacular success by 1965, after which serious set backs were experienced by the NMEP.

Govt. of India had been alive to the progress and problems of NMEP, which is evident by appointment of a series of expert committees who studied the problems and made in-depth evaluations with a number of suggestions and recommendations each time (table 1). However, followup action and timely implementation has been very poor.

Therefore, the foremost requirement for full realisation of gains, by successful implementation of newer strategies, a body of experts/administrators should now be entrusted the task to follow up the recommendations made by the national task force on malaria.

Some of the observations of the task force on the NMCP and NMEP are as follows :

1. During NMCP (1953-58) and early NMEP most of the hard core areas were identified. Yet no efforts were made to have different strategy for such areas except variations in degree of spray operations and resource augmentation. When eradication was well on way recommendations for augmentation in staff (50% and 100% increase) already asked for were made, which shows that augmented resources essential for these areas were either could not be visualised in time or this issue was not taken up seriously before launching of the programme.

2. Preparatory phase very much required and recommended for eradication programme was done away with mainly on the basis of argument that NMCP has provided the required information. NMCP itself had no preparatory phase and its area covered was much less than NMEP which covered whole country. Preparatory phase of eradication programme was supposed to be essential and had three sub-phases :

   a. initial survey or pre-eradication survey to delimit malarious areas and to determine the order in which various malaria zones be brought under eradication programme to provide basis for administrative decisions in planning.

   b. planning - to take into consideration survey data, existing facilities for implementation on schedule and estimates of operations, covering essential items of supplies, equipment, transport and budget.

   c. preliminary operations such as recruitment, training, etc.

3. As the estimates for the man power requirement were inadequate, the material requirement computation was also defective. Initially the estimation of average surface for insecticidal area of a house was 1000 sq.ft. per house this further was raised to 1500 sq.ft. and requirement of insecticide was estimated accordingly. Later on insecticide requirement was made on per capita basis.

4. In 1950 WHO recommended, as an essential pre-requisite during the pre-eradication activities, the development of rural health infrastructure which will ultimately take over the responsibility of vigilance for sustaining malaria free status. However, for various reasons even when large areas were ready for maintenance health infrastructure remained undeveloped and significantly contributed to the set back of NMEP.

   NMEP should have developed some alternate strategy or mechanism to counteract this. Atleast the units in earstwhile hyperendemic areas or areas with special problems should not have been allowed to go into maintenance phase unless primary health care delivery system was developed as per the recommendations of expert committee.

5. Newer disease control strategies, apart from insecticidal coverage should have been developed. Surveillance took more time to stablise than planned. Further, it was soon realised that provision of surveillance worker on basis of population and not taking into account density and topography resulted into poor vigilance in difficult areas. In some areas for instance in state of Madhya Pradesh surveillance workers looked after areas more than 100 sq.km. instead of an average of 30-35 sq.km. This was the case with difficult and low population density areas.

6. Twelfth expert committee on Malaria (WHO) clearly suggested to take into account variations in malaria transmission potentials in setting the needs of vigilance and operations. This was not heeded to and operations continued to be on a uniform pattern in whole of the country mainly based on insecticidal spray, irrespective of local needs.

7. Research was the "first casuality of eradication programme . It almost came to a standstill not only in India but elsewhere also, though field operational research and indepth studies in problem areas were extremely important for finding alternate methods of control.

NMEP & MRC were required to work in close collaboration, in larger public interest, and organise research studies depending upon needs/problems of each state. Desired coordinated action in this direction is still wanting.

8. Second casuality of eradication era was training. During eradication phase effort for training were mostly theoretical with total emphasis on eradication/vector control by insecticidal spray. Under MPO, the PfCP did make a good effort in training field staff at NICD/NMEP. The quality of training is however inadequate and requires revamping and tremendous strengthening.

9. Entomology is an essential tool for malaria epidemiology. During malaria eradication entomological work became routine and confined mostly to studies on susceptibility status of mosquitoes to insecticides. This has resulted into serious gaps in our knowledge. Simple but vital information regarding incrimination of vectors, vector behaviour etc. is not available in several malarious areas. However a useful study has been done by MRC regarding sibling species of An.culicifacies but further work in this area is also required.

10. While launching eradication programme it was believed that urban areas do not require any antimalaria programme, the problem is negligible and will not give any setback to programme. Even when the problems were realised and urban malaria units were established various recommendations of expert committees remain unimplimented.

11. When MPO was launched objective was changed, for time being, from eradication to control but there was hardly any change in insecticidal approach. All areas with 2 or more API were to be sprayed with no flexibility for the states, though the key note of the MPO was to give more flexibility in terms of organisation pattern and peripheral operations based on epidemiological situation, within the frame work of MPO and without departing from technical policies laid down at the national level. However, the instructions and guidelines drawn out did not permit such flexibility and were also confusing, some of which are given below:

- "Spraying operations have to be carried out in sections with API 2 and above provided the vector is susceptible to insecticide proposed to be applied." If the vector is not responding to insecticide the States may send a case to NMEP Delhi, who would discuss the matter in a meeting of the TAC. The TAC would then decide for change of insecticide. This process may sometimes take years and the affected people were left to their fate till then.

- "Some sections with less than 2 API may also qualify for such regular spray operations in view of their special epidemiological status and geographical location etc."

- "As long as DDT offers an epidemiological impact, irrespective of the susceptibility status to it, DDT should be the insecticide of choice."

- "It is clarified that no area should be left out of spray becauseof the reduction in the incidence, till further instructions from the NMEP directorate, who will put up relevant technical data to the technical advisory committee of NMEP appointed by the GOI and obtain their concurrence." Till TAC approves withdrawl, areas would continue to get exposed to chemical insecticides.

- "Entire planning for the selection of areas, choice of insecticide, projections of insecticide requirement, etc. should be worked out in consultation and agreement with the concerned Regional Officer for health and family welfare."

Continued reliance on large scale insecticidal spraying prevented development of alternate strategies for malaria control.

12. MPO was envisaged as a short term measure, as a gorilla warfare with enemy deeply entrenched all over the area. People were provided arms (FTD, DDC) to participate in the battle in each locality. Tendency to direct all such local battles from Army High Command has proved to be counter productive, as local problems/needs were never attended to.

After initial good response by people large number of DDC and FTD became functional. In fact supplies of antimalarials were less than the demand. Instructions were issued to convert all DDCs to FTDs so that every fever case should get drug after blood slide collection. This resulted in a situation where drug availability to patients has been reduced due to closure of DDCs and negligible collection of blood slides by constantly decreasing number of functional FTDs.

13 Problem of sharing of cost between centre and state has always been a difficult one. During eradication phase states which had done better and sent large areas into maintenance were left to bear the cost subsequently and those states who failed to do so continued to get central funds.

During MPO sharing was made 50:50. However, centre instructed that the states will initially meet total requirement of operational cost. Central share was to be subsequently reimbursed. Problem arose when operational cost exceeded the 50% share of the state govt. (mostly due to increase in wages etc.) and state govt. could not spend more than its 50% share sanctioned by the state legislature. Further, all money reimbursed by the centre was debited to consolidated funds of state and was not readily available to the malaria programme. Still more problematic issue was the Govt. order which decided the items to be purchased by centre and states. As centre was to supply DDT, some BHC and antimalarials, the total cost of material supplied by centre became sometimes more than 50% share of centre. This situation recurred frequently due to the rising cost of material and equipment. Some states failed to allocate even 50% of their share to the programme due to resource constraints.

These along with procurement problems adversely affected the eradication programme.

14. Voluminous data received by centre from states require timely and proper analysis and a feed back to the states, which is lacking in the current NMEP set up. Monitoring, evaluation and review meetings with states is very necessary but somehow this is not happening to the desired extent.

15. NMEP (HQ) in Delhi requires adequately trained epidemiologists and entomologists in analytical methods at all levels of organisation. The present set up is very deficient.

Table.1.

COMPARATIVE STATEMENT SHOWING IMPORTANT RECOMMENDATIONS OF VARIOUS COMMITTEES FOR REVIEW AND EVALUATION OF NMEP (1960-1989)

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
MUDMAN COMMITTEE - 1960 Critical review of the NMEP in INDIA. Terms of reference Evaluating the status of the NMEP in India. Prof. John M. Henderson Dr Martin D Young Dr L.J. Bruce chewatt Dr Donald Pltsch Dr E.Harold Hinmen	- Excuses for superficial coverage of houses and villages refusals. Partial & patchy spray. Special prolonged efforts by senior unit personnel required. - Under surface of beds machan's in Assam etc. be sprayed - Refusals due to bed bugs Teams including health educators and entomo-logists should look into it and suggest remedial action.	Even 50% & 100% staff increase is not enough for some difficult areas. For them augmentation of staff and redefinition of units or limited extension of spray period required. - Delay in instituting surveillance. - Failure to recall spraying goals will delay withdrawl of spraying during 1961 in most of the units at enormous cost. - At an estimated cost of Rs.2.01 per head during 6 years of preparatory attack and consolidation malaria has been reduced to a focal disease walled off in well defined pockets for the terminal attack. - Collaboration through meetings and data exchange between agencies like rail roads, coal fields, tea estates defence establishments, PWD Urban corporations, etc. - Planning and execution of MEP requires a unified command precision in the operations, periodic meetings between state programme officers and centre.	Susceptibility level of An.culicifacies has declined. A plan for more underspread testing of susceptibility levels. Serious threat to malaria eradication achievement due to movement of prople and Namadism from to and through malarious areas.	
Chadha Committee - 1963 On preparation for entry of the NMEP into the maintenance phase. Director General of Health Services - Chairman Director of Health Services Bihar Kerala Madras Nysore U.P. Chief Health Division Planning Commission Asst. Director General Health Services	- Vigilance through Govt. & Non Govt. medical institutions private practioners of all systems voluntary agencies. Every village to have one voluntary collaborator. - Each PHC to have a LT and microscope. LT to do simple laboratory examinations including BS examination for malaria. - Blocks with no PHC to establish laboratory in a suitable dispensary till PHC is opened.	- PHC's as per provision be established and on priority in maintenance areas. - Domiciliary visit service for all health programmes Malaria, small pox, control of other communicable diseases and health education etc. - Basic service unit in rural area to cover 5000 population but due to financial limitations at present for 10000 populations. - Medical Officer trained in Malaria in addition to District Health Officer. - Same for zones. - State Malaria Officer be in the rank of Deputy Director. - District laboratory for malaria.	Vulnerable areas and groups be delineated and strict vigilance observed.	- In urban areas PCD additional staff for case detection in PCD and - ACD in slum areas - Special investigation of Foci. Anti mosquito measures in urban areas. For this a plan be drawn by states.

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
Terms of Reference 1. Details of requirement related to PHC, priority to maintenance phase of malaria eradication. 2. Staffing pattern required for PHC, for malaria and other health activities. 3. Utilisation of technical & supervisory staff of NMEP after eradication. Mukherjee Committee - 1966 to recommend the staffing pattern of the PHC complex and integrated health services. Members Union Health Secretary - Chairman Health Secretaries of Andhra Pradesh, Assam, Punjab, West Bengal & UP and Director General of Health Services. Terms of Reference 1. To review the staffing pattern of primary health care complex. 2. To recommend the minimum staff required at different levels, within the districts to provide integrated health services and fully cattering to needs of the vigilance service under maintenance phase of NMEP, small pox eradication, TB. Leprosy and trachome control etc. 3. To recommend the pattern of central assistance to status.	Community participation should be encouraged.	- Regional coordinating organisation should continue to provide inter-state coordination, technical guidance, training and laboratory services. - Direct command from State directorate downwards. - Training for existing health personnel and NMEP staff. Short and long courses. - Notification of Malaria. - Basic health service should be realistically planned and oriented towards tasks which are directly related to the most urgent problems and are precise. - As the initial priorities are solved other activities again with priority be added. - Initial functions are maintenance activities of NMEP, small pox health intelligence vital statistics and health education. - Priorities be periodically reviewed. - Integrated approach should pervade the entire health field notonly in respect of programme but also in operation, organisation supervision and facilities. - Job of every category of workers be defined and staffing pattern should be based on work load. - Supervisory tiers be adequately strengthened and streamlined. - Service conditions and working environment be improved. - Certain control programmes may be undertaken in association with basic health service by strengthening it with additional staff. - Before any mass programme is integrated, criteria and also necessary preparation be ensured this requires. - Operational research		

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
Madhok Committee - 1970 To review the working of the NMEP and to recommend measures for improvement. Terms of Reference - Demarcation of areas with focal outbreaks in consolidation and maintenance phase areas, causes and remedial measures. - Organisation in States. - Adequacy of staff. - Work load of LT & BHW etc. - Logistics - Urban Malaria - resistance in Vectors - Measures for increasing efficiency of NMEP. Members 1. Shri R.N. Madhok, Secretary, Union Health Ministry 2. Dr Moti Singh-DHS Punjab 3. Dr Subramanium DHS, M.P. 4. Dr R.P. Lopez Lauzi, Sr Regional Malaria Adviser, WHO 5. Mr P.R. Dutt, Dy Director General	- Greater operational efficiency be achieved. - Units constituted on population should have been considered on density worker area 35 sq.miles on an average but in MP 59 sq.miles and in some cases 100 sq.miles. - Units be assigned on baiss of terrain and topography rather than population. - There should be flexibility in the matter of staffing of a unit according to actual needs. - Adequate laboratory services be provided. One LT for 1 lac populations. - Large aggregation of labour in project causes problem. Projects to make provision for health & sanitation. Due notice be given to health authorities before initiation of project.	- Assured financial support. - Tunning of Administra-tive procedures to the needs of programme. - Adequately staffed basic health sevice. - Determination in state to cross the hump. - Causes of set back to be investigated. - State health department to enlist active cooperation of Revenue & Punchayat Raj departments and public not to work in issolation. - Staff deficiency in some states be made up and all posts be filled. Budgetary difficultires in way of full staffing be over come. - Temporary staff to be absorbed. - Zonal/Regional offices to form middle tier supervision. - Reversion took place where basic health services and laboratory services were week. They have to be built up as per Mukherjee Committee recommendation with help of liberal grants from centre. Advance indenting of DDT to avoid short falls. Reserve stocks be maintained. Norm of 0.1 pound per capita insecticide recommended. - Phased renewal of ageing fleet of vehicle. - epidemiological squads in maintenance districts to deal with epidemics of all kinds.	- Matter of resistance of vectors to insecticide be given highest importance. Maharashtra and Gujarat have worse problems. - Weakened tradition of Malaria research be revived and strengthened. - Epidemiological, sociological drugs & insecticide research by NMEP & NICD. - 41.60 units never moved out of attack phase. These units are in hyperendemic areas od 20 states and union territories. This is hard core area.	Committee recomends bringing certain urban areas in the ambit of NMEP. Provision being made in IVth plan will partly meet the felt need.

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
Indepth Evaluation of NMEP in 1970 Members 1. Dr T.Ramchandra Rao ICMR 2. Dr Corlos A.Alverado WHO 3. Prof.Robert H.Black WHO 4. Dr Rafat O. Darwish WHO 5. Dr Alan Gillroy WHO 6. Dr David Abonnet US,AID 7. Dr George T.Carmicheal US,AID 8. Dr Edvin Coh US,AID 9. Mr Lawrence T. Cowper US,AID 10.Dr Alanw Donaldson US,AID 11.Dr James Smith US,AID Terms of Reference 1. Identify areas with inadequate progress. 2. Causes of unsatisfactory progress 3. Wheather malaria eradication feasible in these areas. 4. If possible then what change in strategy is required. 5. If not feasible then alternate approach. 6. Review the vigilance mechanism in maintenance phase areas in relation to maturity of basic health services and their ability to prevent reintroduction and spread of malaria. 7. Identify problems requiring research nature type and direction of such research. 8. Realistic appraisal of the resources and management of the programme including economic aspects. 9. Urban Malariaproblem and its impact on the NMEP efforts, Review and recommend future action. 10. Review training and health education activities and future need.	- Operations be markedly improved with an intensified field supervision at every level. - Insecticide to be applied on a total coverage on proper surface, time and dose with check on effectiveness and economy of measures and materials. - Realistic appraisal of the workload of malaria worker be made keeping in view population density, area, nature of terrain number of villages distance to be travelled etcd. Worker be fully trained and adequately supervised after placement both in rural and urban areas in advance of maintenance phase. - PCD by all types of medical institutions and notification of malaria cases is of pavement importance in the maintenance phase.	Operations Planning : Plan of operation has been sound but lacks necessary flexibility to deal with unusual situations. Training : Numerous vacancies and position occupied by untrained persons. Logistics : Insecticides and drugs have not been available on time and in adequate quantitites. Transport situation has detiriorated. Administration : Adminstrative structure of NMEP requires strengthe-ning, Govt. procedures for fund sanction time consuming and combersome when funds available restrictions on use too many. Determination of Govt. : Although intent is mani-fest this is not always followed by positive action in response to recommendations. Recommendations - All phase of administration/ management be directed with a sense of urgency to enable NMEP to junction with greatest effectiveness. - Assure full strength, dependable transport fleet immediately by replacement, repair and maintenance. - Develop operational work plan proposals at Unit level so as to permit adaptations to varrying epidemiological situations by augmented staff, increased supplies and transport, changes in dates of spraying, use of ancillary measures and the like.	I Strategy In Areas now in maintenance: As per WHO definition 57% of the area has achieved eradication. No change in strategy is recommended. Vigilance to prevent re-introduction of malaria. II Consolidation areas No change in strategy III Areas reverted to attack : No change in strategy. IV Areas under persistant attack a. Highly vulnerable and receptive areas, border areas, project areas etc. No change in strategy. b. In areas of persistant transmission Their entry to consolidation areas will be late. They be removed from time phasing of NMEP. Investigate for causes of persistant transmission. Develop and test supplimentary or alternate methods. Augmentation of funds. they are threat to other areas slacking of efforts will increase malaria and deaths where Pf dominates.	Urban Malaria problem becoming increasingly important. Effective urban malaria programme be created or strengthened throughout the country. Placement of trained and adequately supervised malaria workers in urban areas in advance of maintenance phase to maintain integrity of eradication once achieved.

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
SPECIFIC OBSERVATIONS As the success of any strategy will depend in large part on the part of the G.O.I. to provide the essential support to the NMEP.		- Reorganise the central Directorate of NMEP around three major areas, Administration, Epidemiology & Operations. - Make increased deli-gation of resaponsibi-lity along with suitable powers to the officers of NMEP from Directorate down to unit officers to enable speeding decisions within plan and budget sanction. NMEP cannot be run on routine administrative procedures. - Recommendations of Madhok committee on research on research have not yet been implemented. - Basic research in malaria and related subjects should be coordinated through ICMR. Ensure rapid transmission of results to NMEP. - Shortage of trained personnel be made good. - For maintenance fully staffed, trained motivated and adequately supervised general health services are required, to avoid costly failures. Maintenance phase may be devided in two phases. Early phase where general health services are unable to carryout strict vigilance. Here the workers should remain under the direction of NMEP till late or definitive maintenance phase when above conditions are met.		

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
		- Awareness of population movement and measures must be of high degree. - Legislation to ensure proper action by Govt. and private projects in urban & rural areas under strict supervision of health of health authorities to prevent transmission and re-introduction of malaria.		
Committee to study in-depth of relevant aspects of NMEP 1974 Members 1. Dr S.L. Dhar DDG (Planning) - Chairman 2. Dr Som Sundara Rao - Director NMEP 3. Dr V.N. Rao, Jt Director, Health Services-Maharashtra 4. Dr M.I.D. Sharma, Director NICD. Terms of Reference 1. To study in depth all the relevant aspects viz. Administrative operational logistics and achievements of NMEP. 2. To study as to the extent the recommendations of the in-depth evaluation team have been implemented and to list out the reasons of shortfalls, if any. 3. In the light of the above to determine if the goal of malaria eradication in India is achievable and if not, to indicate how the present gains can be consilidated and in what direction objective be changed and following measures to achieve the same.	- National Directorate to draw Plan of spray operations on sound scientific basis, entomological and epi-demiological transmi-ssion period on basis of microscopically diagnosed malaria cases. - National directorate to decide insecticide and rounds ofspray. 1-3 rounds of DDT 2-3 rounds of BHC (6 weeks interval) recommended. Malathion 1-2 rounds to be used minimum in clearly demarcated area - Meticulous planning is essential for spray operations to be carried out by the states under the direction of national directorate. - Focal spray 50 houses around positive cases in areas not under spray during known transmission period.	- Since it is not possible to achieve complete eradication of malaria in the near future the immediate objective be made "Malaria Control". - Malaria workers (house visitors) to work as multipurpose workers under the Medical Officer (PHC) as part of basic health services. - All expenditure on health workers will be met out of budget for health. - One field supervisor for four workers in Rural and five workers in urban areas. - Visits on monthly basis except during transmission season when they have to be fortnightly. After incidence brought down monthly in all areas. Highly vulnerable and receptive areas to have fortnightly visits.	- Present phasing has lost its significance as incidence is widespread in consolidation and maintenance areas. Hence forth these areas to be considered as in attack phase and to conditnue as such till country is in a position administratively and technically to achieve eradication. - 200 attack units earmarked in the country on the basis of incidence. National Directorate to dellineate areas in each unit on the basis of incidence to reveive insecticide coverage plan of operation to be drawn by NMEP Directorate keeping in view, vector, its Bionomics, insecticide susceptibility status, transmission period, type and dose of insecti-cide, spray cycles and precise period of spray.	- Health workers for malaria vigilance/ sur-veillance. - one supervisor for five workers - Workers to collect blood smears in domicially visits. - Urban malaria scheme in 28 towns be implemented then in phased manner in 322 towns selected in 1968. - Active surveillance in urban areas. one worker per 15000 population. - To avoid duplication towns having urban malaria schemes to not have NFCP units functioning there and vise-versa. - Project areas should receive envisaged attention. Population static and migratory of these projects be under special surveillance. RT spraying and other measures recommended

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
	- Epidemic areas should be precisely demarcated. Forecasts to be made by National Directorate for timely remedial measures. In these areas fortnightly surveillance in transmission season. Earmarked areas to get one or two rounds of DDT spray or 2-3 rounds of HCH spray.	- Passive vigilance to be more effective. - Laboratory technician to be posted in each PHC. Supervision by MO & SLT. - Transport support be ensured for supervision and spray. - Adequate insecticide availability in periphery in time be ensured. - Procurement procedures at national directorate and higher levels be streamlined. - Indegenous manufacture of insecticides and anti malarials be raised. ORGANISATIONAL PATTERN for malaria control organisation. National level & RCO - Director NMEP may be designated Director, national diseases control programme (NCDCP). He be made responsible for all communicable diseases except (Filaria). At RCO level emphasis an entomological and epidemiological investigation, supervision and coordination at zone & state levels and supervision of rural urban Malaria scheme. Cross checking of BS.	- Great care be kept for selection of villages/ sections for spray based on Vulnerability receptivity and other epidemiological considerations. - Population movement seasonal routine or occasional poses danger of introduction of malaria in receptive areas. Mass blood survey insecticide coverage to be provided to areas where they reside for long period. - Area of insecticide resistance out of 143 units where tests were made DDT resistance in Anculcifacies was found in 105 units (71%). Susceptibility tests twice a year in attack units is proposed. (one before spray and one after). - Use HCH where DDt resistance if vector is susceptible. - After prolonged use insecticide resistance to HCH may also appear but there may be reversion to susceptibility to DDt when it can be used again. - Double resistance in 20 units in Maharashtra and Gujarat where intensified HCH spray did not let incidence to rise in areas where malation spray is not possible. HCH 3 rounds be given.	

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
		State HQ State Malariologist be designated as joint/ deputy/Asst. Director of Malaria & Basic health services. State entomoligst to get Junior Entomologist, 1 entomological assistant lab. asst. 1 lab attendant and 5 insect collectors. Zonal : Organisations to be maintained at Divisional HQ. UNIT : Staff as per requirement area etc. eidemiolgical require-ment. For areas not under spray one squad of 10 FW and 1 SFW be stationed at HQ, ACD, RT. HIGH POWER COMMITTEE be constituted to remove bottlenecks of finance sanctioning of posts, procurement etc. Non-Health Minister. - As the programme is that of containment states and centre should be equal partners. The assistance to be 100% for equipment, transport and insecticide etc. The States to provide operational cost from their own funds as per staffing pattern recommended by NMEP Directorate.	- Before malathion spray it may be tried in one unit area as pilot project. - Area with Chloroquine resistance in Pf resistance demonstrated by NICD can in DIPHU unit of Assam (52.5% Pf cases resistant) to chloroquine at RI level and 22.5% at RII level. Further studies recommended. - Area with persistant transmission. Investigation to determine causes and develope to test alternative measures. - Entomological studies. Entomological services should form the back bone of the programme as the emphasis on attach on vector. At zonal level - index area in persistant transmission area, vector densities periods of peak densities, manbiting rate, longivity and other factors and their relation to disease be studied. Role of secondary vectors. Anti larval operations by locations of breeding places of vectors. State level - Guidance to zonal organisations, cross check consolidate and forward to national directorate through RCO.	

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
		- With a change in strategy the reports and returns be revised by the national directo-rate. - a massive re-organisation of training of different personnel should be made at the state, RCO & National levels. - Inititate action on health education to counter social empediments to the programme. - Malaria should be specified as an epidemic disease under epidemic diseases act 1898 to deal with high refusal rates or spraying, reinforce case detection system, dealth with projects reduction in. - Research support is absolutely essential.	At RCO studies in index areas selected other than zonal organisation. Assist the states zones in their studies, cross check and independantly carry out susceptibility tests. National Directorate should guide states in selection f index areas through RCOs receive and consolidate data and provide guidelines for preparation of annual plans of operation for malaria control.	
ndepth Evaluation of MPO under NMEP f India - 1985 r V.N. Rao — Chairman r R. Pal — Rapporteur r M.A. Farid r G.J. Gille rof. B.L. Hubendick rs Hridule Krishna r MAH Mashal r K.G. Nath r V.S. Orlov r R. Reuben r V.P. Sharma r G.T. Shute r G. Tam r J.A. Najera rms of Reference Assessment of MPO with special reference to PfCP Measures for strengthening Malaria Control activitiy through the PHC system Constraints and limitations in effective implementation and recommendations to remedying the same Future strategy of Anti Malaria activities. Identify areas of operation research to make programme cost effective and efficient.	- Accountability, flexibility of operations and motivated commnunity participation. - Case detection and treatment activities conductedd through Primary health care system and preventive activities carried out through the specialised Anti-malaria epidemiological services within the overall structure of the health services. - Ready access to anti-malaria treatment based on total coverage in space and time for every inhabitant of the malarious areas. - Methods for monitoring and carrying out impact assessment to reflect adequately objectives and targets of programme.	- Formulation of pracise long and medium term objectives and targets based on malariogenic stratification of the country to be done in first half of 1986 and three year strategy plan must be drawn by the end of 1986 - Training in Malariology should receive highest priority by creation of Training centres at the national and state levels. - Plan of action to enlist active community participation and health education should be worked out jointly by central and health education bureau and the Anthropological Survey of India, NMAP and ICMR within six months. - Division of (i) Planning and epidemiological assessment and (ii) operational research and development should be opened at NMEP HQ and in the states. Operational Research in NMEP and ICMR to planned and Monitered jointly by them and other experts with immediate effect. - A committee under Planning commission to work out - Negotiations with SIDA should begin immediately for the continuation of PfCP for the VIIIth plan period - Director NMEP should be made ex-officio Additional Secretary to the Govt. of India	- Adequate epidemiological services with applied research and training components capable of planning, monitoring - In build response capability to meet emergency situations. - To reduce continued dependence on insecticidal spray, Environmental intervention measures need to be executed through effective inter and intra sectoral coordination.	A committee may be constituted under planning commission chaired by member (S&T) to workout the modalities for Industrial establishments to undertake anti malaria measures. Guidelines by this committee may be made available to NMEP not latter than March 1986. Environmental intervention measures should form an integral and in built part of Urban development and water resources project and rural development programmes like IRDP, NREP, RWS, IDSMT, ICDS Tribal Welfare and Social forestry programme.

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
ndependent appraisal team(IAT) 1989 erms of reference . To critically examine the policy issues and control methodology incorporated in VIIIthe plan document prepared by the NMEP 2. To review the operations under the modified plan of operation (MPO) for control of malaria and to determine the impact of operation on the epidemiological situation. Members Dr V.P. Sharma Dr D.C. Hazarika Dr V.S. Orlov Dr G.K. Sharma Dr P.R. Arbani Dr Udom Chitpraro Dr Mahindra Dutta Dr H.G. Gratz Shri N.L. Kalra Dr O.P. Khattar Dr R.S. Pandey Lt.Col. P.B. Pillai Dr R.R. Purohit Dr E.S. Rahavendra Dr Ramlingeishwar Rao Dr A.P. Ray Surg. Com. Prakash Singh Dr H. Swaminathan From NMEP Dr B.N. Barkakaty Dr S.K. Chawla Dr S.C. Dutt Dr S.P. Misra Dr S.P. Rao Dr R.C. Sharma Dr G.P. Singh	- Present accounting system and financial arrangements of sharing expenditure on 50:50 basis between centre and states is combersome, and should be simplified. - GOI may release funds to the states in advance at quarterly intervals to ensure regular flow of funds for timely operations - State Governments should release funds for field operations atleast six weeks before the commencement of spray operations	- NMEP and Primary Health care system be provided complete staff complement as envisaged. - Responsibility and accountability of each category of staff within the health organisation should be enforced in respect of anti malaria activities - Laboratory services should be improved/strengthened by providing adequate number of microscopists as per norms. Availability of microscopes and material be ensured at each PHC/Malaria clinics to make them functional and to increase the efficiency of epidemiological monitoring system. One S.L.T. for ten PHC for training and supervision. - GOI should enact a law applicable to all notified areas, Municipalities towns, corporations for the prevention of mosquitogenic conditions to bring uniformity in the implementation of legislative measures throughout the country. - Meetings between NMEP & MRC to be held twice a year to discuss ongoing research and problems faced by the programme research findings that are ready for implementation in the field be transfered to NMEP and envolving states. - States may be given reasonable flexibility in organising malaria control operations to enable them to modify priorities according to local needs. Expert committee comprising of experts from centre and states should be established to advise the state Govt. - Malaria programme officer is a critical post and should not remain vacant. An understudy be appointed atleast six months before vacancy.	- Field Operations should be based on Malariogenic stratification with a view to rationalise application of various control measures suitable for local malaria situations. Expertise of MRC & NMEP directorate be pooled and a joint committee may be constituted to work on stratification and complete this task in the shortest possible time. - Under MPO spraying was done on basis of API 2 or above. This is no longer valid. Therefore, technical advisory committee (TAC) may suggest parameters for spray operations based on resource constraints and also decide on the type of insecticide to be used. This exercise be completed one year before spraying to enable procurement of insecticide well in time. - In areas where replacement insecticides such as malathion, fenitrothion or any synthetic pyrethroids are recommended by the TAC, it would be advisable to resort to these replacement insecticides as a short mterm measure i.e to suppress epidemics or high transmission and revert back to DDT and preferably to bio-environmental control methods during the interepidemic period. This would help in controlling tranmission of malaria at reduced operational cost and delay the onset of resistance for a very long time.	- Govt. order by competent authority be issued to appoint/coopt a Malariologist and entomologist on the screening committee of projects in all sectors of economy (central state or private) for clearance from mosquito breeding potential angle. - in all project areas malaria survey should be carfried out with geographical reconnaissance of the project and surrounding area to determine extent of essential anti malaria engineering works which can be incorporated in project design at planning stage to prevent creation/ elimination of malariogenic conditions. Project outlay should incorporate realistic estimates of funds for above.

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
	Wherever the spray operations are undertaken sister departments viz. tribal, welfare, forest, local administration, panchayat should be fully involved, and advance programme of spray should be meticulously drawn up and executed according to time schedule. In areas which are not under regular insecticide spray, focal spray should be undertaken during transmission season. The extent of area to be covered should be decided on technical considerations by State malaria organisation.		The decision on the application and type of replacement insecticide, its duration of application and the strategy for inter-epidemic period should be decided by the TAC on epidemiological considerations in each case. - In areas where A.culcifacies is the chief rural vector spraying should be based on the latest information on sibling species complex. In other areas a similar rational approach to spray operations may be undertaken. - Bio-environmental control methods should be introduced simultaneously to curb vector densities and disease transmission. - Migration of population is one of the major factors. Adequate arrangements should be made for identification of itinerant labour and their place of origin for the implementation of appropriate control measures. - In areas of intense malaria transmission ACD and prompt drug administration should be strengthened by providing additional domiciliary workers. - Epidemiological unit should be established with an epidemiologist/ malariologist and suitable number of staff recruited at state headquarters and zonal levels to carry out epidemiological analysis and surveys.	

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
			- At present, there is no monitoring of malaria incidence in urban areas. There should be activated passive surveillance in urban hospitals and medical insititutions with adequate provision of laboratory services. - An entomological cell should be established in each urban area to provide support to the field work. - Urban areas emphasis should be on bio-environmental methods and they should be intensified and implemented under proper supervision. - Drug policy of NMEP 1982 may be suitably amended by an expert group so as to evolve rational policy for problem of chloroquine resistant P.falciparum. - Research on field operations has not received adequate attention and priority. Some research projects have been identified, which may be taken up to increase the effectiveness of programme. - Training and re-training facilities for PHC and other NMEP staff at the centre/ state and peripheral officers involved in malaria programme should be established at National and State levels.	

	Operational	Financial and Administrative	Technical	Urban Malaria Projects
			- Specialised workshops on mosquitoes and diseases transmitted by them should be organized on a regular basis as a part of continuing education for engineers, clinicians, health administrators and other identified groups. - Community participation through voluntary agencies and intersectoral collaboration should be fully explored.	

CHAPTER 9

RESEARCH BACK UP FOR MALARIA CONTROL

Need based laboratory and field research directly linked to local demands for malaria control activities, generated by district microplan should be supported at national and regional levels. Areas of basic and applied research which require special attention may include clinico-epidemiology, parasitology, entomology, ecology, serology, immunology, health services delivery system, and knowledge, attitude and behaviour (KAB) of communities. Tp make results of research more meaningful these areas of research should be viewed holistically rather than individualistically.

The aim of these researches should be to improve upon the efficiency of the methods of disease diagnosis, treatment, management, and control of malaria vectors, without environmental hazards.

National institutions, which have well equipped laboratories, experienced faculty and traditions of basic and applied research on parasitic/communicable disease may be identified for research on malaria. Malaria Research Centre (ICMR), Delhi; Vector Control Research Centre (ICMR)-Pondicherry, NICD, Delhi and NIH&FW, New Delhi can be identified as nodal institutions for research activities. These institutions should jointly constitute a core group of experts to guide and coordinate research and its application in field. The present NMEP should be fully involved and supported for field operational research. However duplication of research should be avoided. In-depth evaluation of NMEP held in 1985 strongly emphasized the need of trained scientific and technical man power in the field of Malariology. This felt need was subsequently reiterated by several indepth evaluations of NMEP. Development of manpower takes a long time. Capable and competent technical and scientific staff in the field of malaria must be retained through a suitable mechanism for time bound result oriented applied field research.

Some of the areas in research which may require attention in tribal, non tribal and urban areas are indicated below. However, research efforts should largely be focused in well identified areas depending upon the problems faced by local health personnels.

1. Epidemiology : The main focus of epidemiological research as applied to malaria should be on improving methods of disease control, in order to attain low rates of case fatality, morbidity, extent of duration of disease and its incidence. Seroepidemiology and serodiagnosis in malaria control should also find appropriate place for a better understanding of situation specific malaria epidemiology with respect to parasite species and human host.

2. Chemoprophylaxis and antimalarial treatment : In persistent transmission areas the role of chemoprophylaxis in pregnant women and children of different ethnic groups, in relation to clinical manifestation and levels of parasitaemias needs to be adequately investigated. Antimalarial prophylaxis/treatment in relation to red cell genetic defects should also form part of the investigations. Districtwise mapping of these genetic variants is essential. In persistent transmission areas children on regular antimalarial prophylaxis with pyrexia should also be screened for bacterial infections, as sicklers are not expected to be febrile.

3. Clinico-parasitology : This is an important area of research and as such data form areas with different transmission potential are very scanty. For a clearer understanding of epidemiology, as a local parameter, relationship of the occurrence of clinical symptoms of malaria and malaria parasitaemias, particularly among children and pregnant women in intense transmission

areas require greater attention for research. In other areas including urban and rural, with low/moderate/high transmission potential, these features of clinico parasitology should be properly understood, as they have bearing upon control operations.

4. Entomology : Areas of research on malaria vectors which deserve priority include methods of recognition of intraspecific genotypes and their relative vectorial capacities. Ecologically polymorphic vector species need to be distinguished for their differential functions in respect of entomological support parameters for malaria transmission. Mosquito species like Anopheles culcifacies, An.dirus, An.annularis, An.fluviatilis, among others, are important candidates for research. Functional characterization of traits critical for taxonomy and systematics (by methods including morphometrics/ numerical taxonomy/biochemical taxonomy) can support delineation of species, subspecies or strains, for purpose of taxonomy/systematcs and their vector efficiency.

Local strains of predators/parasites/pathogens should be carefully screened and their potentials as bio control agents should be adequately explored by loboratory and field research, as priority area of research. A local/ indigenous strain of bio control agent if found efficacious would be a most cost effective, acceptable and easily applicable method to support the malaria control activities at local level. This method can even be tried around silk industries without the risk of damaging the industry.

5. Parasite characterization : Taxonomic characterization of species and strains of malarial parasites in relation to their clinico-epidemiological characteristics and response to antimalarials is an important area of research. Recombinant DNA techniques can be used to show differences in the organization of genome in different isolates. In view of the pressure of drug on malarial parasites, molecular characterization of species particularly P.falciparum genome can lead to the identification of polymorphic loci and mechanisms generating genetic diversity. The studies on genetics and population dynamics of P.falciparum in particular will reveal underlying causes for fluctuations in different serotypes in time and space. Thus integrated field and laboratory studies on the interaction between population genetics and dynamics will be necessary to describe the population biology of malarial parasite.

Species specific detection and identification of sporoziotes in field by peripheral health personnel is important area of research. Cost effective diagnostic tool without involving individual mosquito dissection needs to be devised. The existing ELISA test kit might prove expensive in long run. Therefore a sustainable tool/method is needed for the periphery.

6. Sociomedical aspects of malaria : Information on different ethnic groups and communities with regard to people's knowledge, attitude and behaviour (KAB) towards malaria, surveillance, drug therapy and vector control measures needs to be assessed by various methods. similar assessments should also be done on urban and non-tribal rural populations periodically. The role of various agencies in health education, community participation in malaria control operation need to be studied periodically and compared for its impact on disease incidence.

7. Field operational research : Periodic studies to evaluate the effectiveness of Malaria Link Workers (MLW), Village Health Guide (VHG), and bilateral agencies in case detection, treatment and creating awareness in the community should be undertaken. Effect of personal protection methods like bednets on the mortality in children using bednets should be compared with those not using bednets but are under chemoprophylaxis. Studies should also be mounted on various aspects of diagnostic and primary

health care delivery systems, operating at the periphery involving the role of different categories of health personnel in the deliverance of these basic services.

Malaria control programmes need to develop the capability to undertake applied field research on issues of direct relevance to control objectives. The objectives and design of operational research projects should be established within countries and should be closely tied to the particular problems identified during planning, implementation, and evaluation of control programmes at all levels. Those who will have the taks of implementing the results of the research should be closely involved in the process of doing it, so that they are committed to its conclusions.

The research issues should address not only the efficacy and cost effectiveness of specific interventions but also related areas that influence them and other components of programme and management activities. These will include effective epidemiological response capabilities; community perceptions and treatment practices; referral systems that really do work; antimalarial drugs use policies which are practised and monitored; career structures; continuing education and other structures which truly motivate workers so that no outside stimulation is necessary for the job to be done properly; and effective supervision which supports the goals of continuing education and work motivation, and is linked in with the evaluation process.

Specific research topics could include :

- identification of areas with a potential risk of outbreaks/epidemics;
- seasonal variations in malaria and its clinical presentation;
- monitoring of drug and insecticide resistance and formulation of recommendations;
- determining the extent of malaria morbidity and mortality in an area and defining populations at greatest risk;
- KABP study ot malaria;
- protection of pregnant women;
- clinical diagnosis in different age-groups;
- treatment guidelines;
- efficacy of current and alternative drug treatments;
- quality control of marketed drugs;
- efficacy of personal and community-based protection measures (eg impregnated bednets) in areas of high transmission level;
- defining and refining selected indicators within the information system.

8. Health Services Research : Structure and functions of health services is an important area of research. Methodology of planning, evaluation, improving malaria control strategies adopted to local conditions also require research support to improve the quality of health delivery system. Assessment of beneficiaries with respect to cost effectiveness of control strategies and management of malaria control viewed in totality requires periodic analysis.

CHAPTER 10

MANAGEMENT INFORMATION SYSTEM

Principles for change : Valid and timely information is essential for the functioning of malaria control. Information is used at all levels of the health system to instruct staff and to guide change. It serves to inform policy and decision makers as well as the public. Data are exchanged between units at the same level and are reported to higher levels for the purposes of comparison and analysis. Information is required to describe the situation for the formulation of policy, to plan public health and curative action, to prevent and deal with epidemics and outbreaks, and to assess both the impact of malaria disease and the results of control. Information on the availability and quality of resources (personnel, supplies, finances, structures, etc.) is required to determine the scope of control operations, for planning, and management. As part of the implementation of the global plan of action for malaria control a changed approach will have to be taken to information systems. Principles for change are :

1. The emphasis is placed on the community level of control (bottom-up approach) improving the measurement of health care delivery in both public and private sectors with a focus on marginalized populations with the least access to service and the highest risk of infection (remote rural areas and urban slums).

2. It is recognized that information on malaria is needed and used at all levels, and is required for the information of policy makers, the general public and sectors outside the health system as well;

3. It is acknowledged that malaria is focal and presents itself differently from one situation to another;

4. Malaria is virtually indistinguishable from other acute febrile illness at the community level and in the absence of unrealistically sophisticated medical technology at next higher levels;

5. Data recording and reporting should be limited to those data which are necessary for curative and preventive action, and for the prevention and rapid reaction to outbreaks and epidemics. Where malaria control requires additional data, the methods used should not exceed the means and capabilities of the services at the levels needing the data, or what is available from sources outside the health services.

6. The responsibility of information on malaria is moved from a specialized service to the general health services;

7. Data collection has to respond to realistic needs in planning, monitoring and evaluation including the assessment of impact, it has to be cost-effective;

8. Linkages across programmes and sectors and between providers and clients are emphasized.

In India these changes will call for radical redeployment of resources to collect, analyse and report information. A revised information system cannot be put in place over-night. It needs to be planned, implemented and evaluated. The following might be followed :

1. Reorientation of the use of data directly related to disease management;

2. Reorientation of existing monitoring procedures to achieve cost effective disease management and related support functions;

3. Strengthening of the general epidemiological capacities supporting prevention;

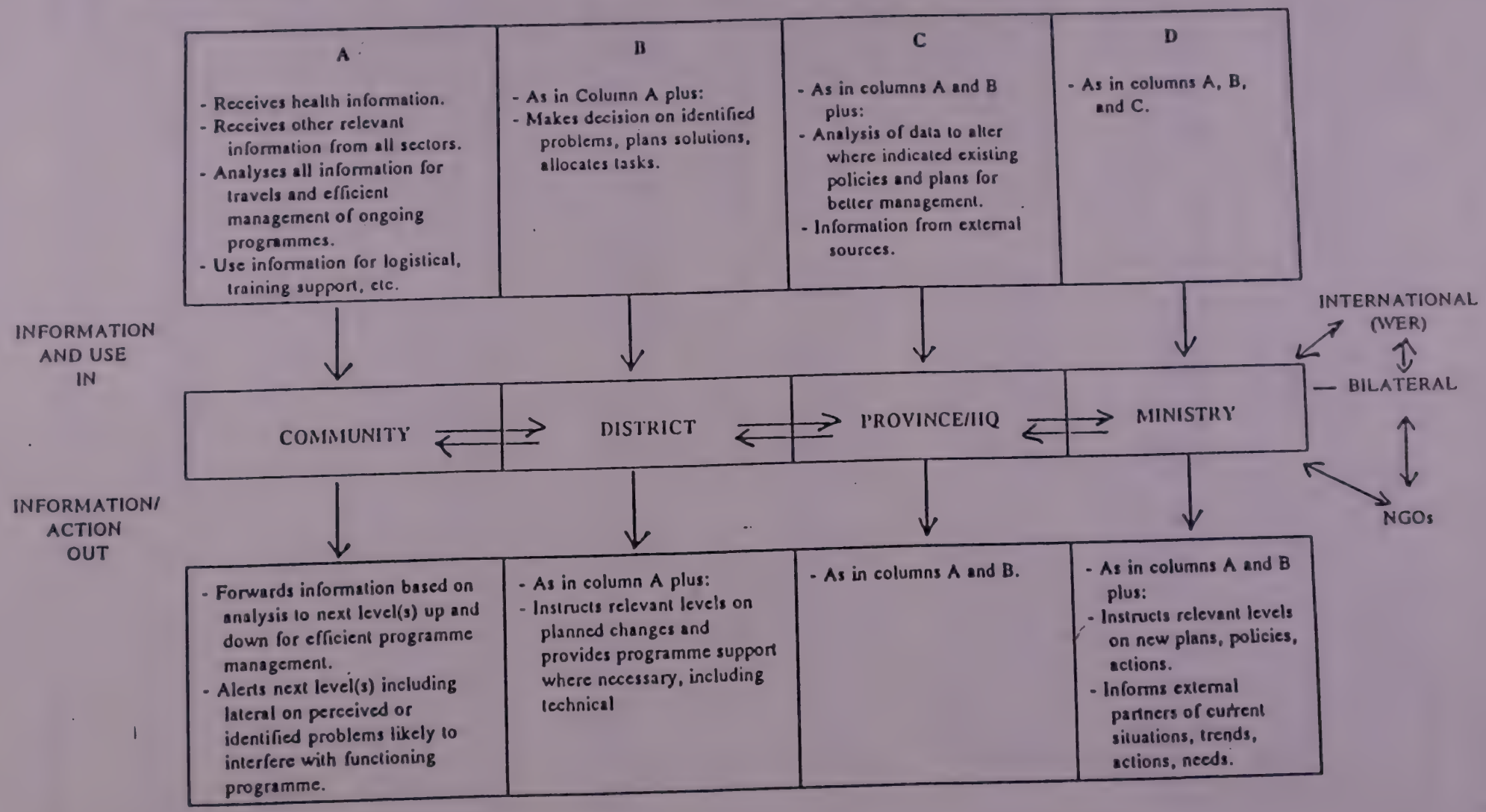
4. Development of an evaluation system for emergencies.

Responsibilities for information systems : The Global Malaria Strategy emphasises that information should be limited to those that are directly required for setting and monitoring targets associated with malaria control interventions. It is important to note from the outset that different data are needed at each level of the health care system. Examples of the types of information required at different levels are illustrated in table 1.

Table 1 summaries the responsibilities for information systems at the different levels of the health care system.

TABLE I

USING HEALTH INFORMATION FOR PROGRAMME PLANNING, IMPLEMENTATION AND MANAGEMENT


A
- Receives health information.
- Receives other relevant information from all sectors.
- Analyses all information for travels and efficient management of ongoing programmes.
- Use information for logistical, training support, etc.
B
- As in Column A plus:
- Makes decision on identified problems, plans solutions, allocates tasks.
C
- As in columns A and B plus:
- Analysis of data to alter where indicated existing policies and plans for better management.
- Information from external sources.
D
- As in columns A, B, and C.
INFORMATION AND USE IN
INTERNATIONAL (WER)
BILATERAL
COMMUNITY
DISTRICT
PROVINCE/HQ
MINISTRY
NGOs
INFORMATION/ ACTION OUT
- Forwards information based on analysis to next level(s) up and down for efficient programme management.
- Alerts next level(s) including lateral on perceived or identified problems likely to interfere with functioning programme.
- As in column A plus:
- Instructs relevant levels on planned changes and provides programme support where necessary, including technical
- As in columns A and B.
- As in columns A and B plus:
- Instructs relevant levels on new plans, policies, actions.
- Informs external partners of current situations, trends, actions, needs.

General principles related to information : Malaria occurs in the community and to a great extent outside the auspices of the health care system. Approaches to monitoring malaria in the community, and how the community manage the disease problem has been neglected. Malaria control programmers need to identify methods to monitor malaria at this level if they are to better understand how to develop and strengthen community care. Where patients reach the primary health care system, they will mainly be seen by undertrained persons. Most of the data generated from the periphery which give an estimate on the burden of disease originate from this source. Some of the data will be viewed as useful by the peripheral health care workers and as such they will be motivated to continue gathering them. Other data, very relevant to the objectives of the well trained persons working at the upper levels will be of low interest and will be badly and inaccurately collected. It is therefore essential that information requirements from the periphery of the health care system be limited in terms of the quantity required, and certain criteria of choice would be associated with direct relevance to the key objectives of the malaria control targets set at the different levels of the system.

Key information, or indicators, must in general be valid, meaning that the indicator is a true and accurate measure of the phenomenon under study; reliable, meaning that the measurement is consistent and dependable across applications or time; directly related to service procedures and anticipated outcomes, such that a change in the indicator will occur due to and can be attributed to control interventions; readily interpretable; and operationally useful. They must be easy to measure and not expensive to gather. Groups of indicators may be combined to give an overall comprehensive picture of the status of malaria, whether targets are being met, and the success of the operational process.

How often indicator levels are measured is referred to as "periodicity". The desired frequency of measurement may vary by objective; ,indicators should be sensitive to control activities and thus be expected to change over time, where appropriate, baseline levels should be obtained before interventions begin. The baseline may be constructed historically if secondary data sources are used; for primary data sources, allow sufficient time to collect and analyze data and incorporate results into programme planning; and a follow-up measurement on an indicator should not be conducted until there is some reason to believe there has been significant change.

Some critical observations

1. Management function includes planning, operation, monitoring, control over various resources for their optimum utilization towards achieving the objectives of the programme.

2. Planning function requires information on the level of existing situation and coverage in order to plan for the future to improve these aspects. All levels in the hierarchy will be involved in planning functions. Planning i.e. determining what is to be done may differ from one level to another in the hierarchy. The State and Central levels will involve in formulation of policy and goals; selecting among alternatives (one or other of the alternatives) based on various factors including financial, sustainability, organizational feasibility, etc. The field level planning function will concern with operational details to achieve the objectives set for control of malaria by providing efficient public services.

3. Monitoring i.e. checking whether the various control activities are progressing satisfactorily, is an important managerial function. The role of middle management in monitoring is particularly important.

4. Coupled with evaluation i.e. the process of assessing the achievement of the stated objectives of malaria control monitoring and evaluation (M and E) form important components in management function of the programme. M & E helps to identify problem areas in performance the reasons behind the problems, identify or select possible corrective actions and implementing those actions to improve performance. In this process a feed back of the evaluation findings to other echelon in the organization and involving them in the process of planning decisions helps in "Participatory Planning" and management by objectives.

5. The purpose of monitoring is thus to take corrective actions when performance (including financial performance) is deviating from scheduled level. So selecting CONTROL INDICATORS which reflect permissible range of programme performance, gathering information on performance and comparing them with set norms, and taking corrective steps shall be enabled by the management information system (MIS).

6. The type of information required will vary with the level of the manager in the organization. The information shall be sent timely, valid, and in the format decided upon. The data shall be simple to collect and report by the field level functionaries, easy to fill in formats; not increasing their scriptory workload; useful for managing the programme not only at higher levels of management, but also at the level of generation of the data itself. The process is a continuous one and hence over a time large amounts of data and information can be gathered. So good retrival system shall be built in the information system. Computerization will help in this process. The basic data collection will be the only activity then to be attended to, the rest being taken care of by computerization process, by proper programming.

7. The critical functions in the revised strategy of Malaria Control in India are :

i) Early detection of malaria cases and administration of appropriate anti malaria drugs; This is to be achieved through :

   a) patients seeking diagnostic and treatment facilities by themselves.

   b) till (a) is achieved to a satisfactory level, the service agency to help to provide this service by periodical visits to the community (ACD).

   c) Malaria microscopy services to ensure prompt diagnosis by examining blood slides.

ii) Based on these further actions with reference to reducing transmission potential in the community by spraying (regular "round" sprays or focal spray) or anti larval work (especially in urban areas) or by personal protection methods (using residual insecticide impregnated mosquito nets).

iii) Peoples' activities viz. behaviour of people seeking early care when sick, and behaviour of healthy people taking preventive action by allowing residual insecticide spray or mosquito nets calls for good "Education" in the community towards optimum social mobilization towards malaria control programme.

8. Support system for adequate functioning of the critical functions are to be provided. This support system can be in logistics (supplying microscopes, stains, slides, hagedorn needles, anti malaria drugs, records for data collections, format for data collector and information flow, providing residual insecticides, sprayers, spray-men, etc. providing services for special entomological, epidemiological studies, and materials for IEC) and financial support and supervisory support for all the activities.

9. The present set of "reporting formats" and registers used by NMEP and those prescribed under "HMIS-Ver.2" were studied.

10.1 The NMEP records and registers were prescribed at a time when 'Vertical' programme had to be launched because of lack of organized basic health services throughout India. These records and registers under NMEP had served the needs of NMEP well. Detailed data regarding every family in rural India was available with the unit offices; full picture of the parasitological pattern of malaria disease in various parts of India had been gathered. But during reorganisation of NMEP with the introduction of modified programme of NMEP, care has not been exercised to have these records and registers pertaining to a primary health center (PHC) to be handed over to the PHC. This has resulted in loss of valuable data in many places.

10.2 The records and registers used under MPO-NMEP does not fit in with the needs of the organization discharging integrated health functions through a pair of health workers to the community in their jurisdiction.

11. Review of HMIS Ver.2

11.1 Director, Central Bureau of Health Intelligence of Directorate General of Health Services, G.O.I. and Health Information Systems division of National Information Centre of Planning Commission of India has developed a Computer Compatible Health information system now named "HMIS-Version-2".

11.2 HMIS-Ver.2 is said to contain "Minimum essential requirements for Managing the Health Services upto the district level with in-built potential for expansion to incorporate the essential requirements above the district level too". The system is designed to "bring out output tables according to the need of the user, at various levels."

11.3 "HMIS-Ver.2, in essence, consists of the following data input in the District Computer system.

A. P.H.C. Report
B. District/Sub-Dist./Spl. HOPSITAL Report
C. Pvt. Hospital/Nursing Home report
D. Camp Information Report

11.4 Multipurpose Health Worker Male, and Female generate "Subcenter" information by filling the "subcenter form". (F1)

11.5 The PHC Computer/Compiler aggregates subcenters' information, and also those of PHC Clinic and Laboratory and this "PHC Format" (F-01) is handed over to District Health Statistical Cell."

11.6 District Health Statistical Cell also receives data from District hospitalsd, Special Hospitals (F-02), Private Hospitals/Nursing Homes (F-03). All these can be fed into Computer by the District Health Statistical Cell and output table can be generated.

11.7 The HMIS-Ver.2 formats are composite form for noting many activities and many diseases and one among them is Malaria and antimalaria activities.

11.8 In the 'Monthly form from subcenter to PHC', item No.9 deals with MALARIA.

11.9 In the 'Monthly Report from P.H.C. to District' Item No.9 and Item No.15.1 (drugs, slides, stains) deals with Malaria.

11.10 In the monthly report from Dist/Sub-Dist/Spl. Hospital to District items No.9 to 15 deals with Malaria.

11.11 Item No.9 in 'Private Hospitals Form' deals with Malaria.

11.12 These formats were studied for their content, and the indices they can generate. The table below gives the various indicies that can be generated by the HSC, PHC formats and hospitals formats.

Form	Indices								
	BER	PI	IPR	CPR	SPR	SfR	RT%	Death due to Malaria	Spray coverage
HSC (F-1)	Y	Y	Y	Y	Y	NO	Y	Y	NO
PHC(F-01)	Y	Y	Y	Y	Y	Y	Y	Y	NO
Hospitals, Govt & LB Private (F-02,03)	NO	NO	NO	NO	Y	Y	Y	Y	NO

Key

BER Blood Examination Rate
PI Parasite (Malaria Parasite) Incidence
IPR Infant Parasite Rate (Malaria)
CPR Child Parasite Rate (Malaria)
SPR Slide Positivity Rate (for Malaria Parasite)
SfR Slide (plasmodium) falciparum Rate
RT% Percentage of Malaria Patients given Radical treatment
Y Yes

11.13 From the HMIS form for the subcenter the various parameters as noted in the table can be generated except SfR as no "species-wise" classification is there. If this is noted, then "sfR" and Pf% can also be generated.

11.14 In all the HMIS forms sex-wise classification of malaria cases is not prescribed. As malaria cases can occur equally in both sexes this is not absolutely needed. So the omission of this conventional classification can be accepted. But since during pregnancy special attention may have to be paid to that women, it is advisable to note pregnancy in a women with fever.

11.15 In the P.H.C. format while spray activity dates and insecticide used can be known, O/o coverage can not be known.

11.16 The hospital formats includes one for collecting data from Private Hospitals and Clinics. This is a welcome one as this group usually escapes the 'data-gathering' by the official agency so far.

11.17 While BER can be calculated from PHC data, this can not be done from hospital data as the area of catchment of patients to hospital is not so well delimited as for HSC or PHC. The cases may come from neighbouring districts also.

11.18 From "form-02" the total new cases that attended the hospital during the reference period can be known. Proportional malaria cases from among these new patients can be worked out. An increasing trend can point out the need for further detailed studies in the "catchment" area of the hospital.

11.19 Under item no.12 (form 02) death among inpatients are to be noted. Using this data and the data under "9.5" of this form, proportional mortality rate due to malaria among the inpatient deaths can be worked out. This can be an indicator calling for further detailed analysis.

11.20 In 15.1 of form 01 and 02, details regarding stock of 4 items only viz. 4AQ tablets, 8AQ tables, microslids and malaria stains, are called for.

11.21 Though in "form 01" under item 9.6, provision to note spray activities is provided, in 15 of form 01 details of stock of residual insecticides has not been included.

11.22 In general, the HMIS registers, and formats contain most of the information required for managing the malaria control programme, in the context of overall health development schemes of the district. Certain areas where this information can be strengthened without changing the basic format is indicated in the review. If early operationalisation of this information system is commenced throughout India, it will be welcome.

11.23 In subcenter register 1 (Part II) a map of the village can be annexed, showing details as called for under items 9 and 10 of the register.

12. For the management of the MCP, the Medical Officer, PHC shall know which villages (which hamlets of villages) have not been reporting cases and if so whether this is because of failure of "Surveillance" or whether such areas are really "free from Malaria". There is no provision in the formats under HMIS to know this.

13. The main activity of case diagnosis and treatment will be through microscopic examination of blood smears taken from patients suspected to be most probably suffering from malaria. So blood smear has to be taken from every such patient and sent to the laboratory at the PHC (at designated laboratory in urban areas). The blood slides have to be sent along with a list of patients from where such slides have been taken; and a copy of this list with the results of the microscopy examination of the slide are to be remitted back to MPHW for administering RT; and to the MPH Superviser for organising further control measures (focal spray in urban areas, and in rural reas where no round spray is practised). The preparation of this list of patients takes sometime; and some data regarding identity of the patient is to be written, more than once (by MPHW, by lab Technician) and while furnishing details of RT administration). So one format which the originator of the series of actions can fill, and later made use of by microscopist, by RT provider by evaluator (MO PHC or in urban areas the health officer/Jr. Entomologist/Executive Officer) can be designed and used. One such format is given in the Annexure I. If 1+3 copies are made (by using carban sheets) by MPHW or FTC volunteer where blood

slide is made and 3 copies are sent to laboratory with blood slide, the laboratory case make use of this filled formats to note the results of the microscopic examination against the individual blood slide enteries, and forward one copy to MPHW, MPH Supervicor, retaining 3rd copy for their record purposes and compilation of information. No other particular from the field will be required later regarding the hamlet, village surveillanced; only particular regarding RT, death if any among the malaria patients will be required to be supplemented. The MPHW, MPHS can furnish these data during their monthly meeting by filling in the appropriate columns in the format.

14. Proper programming in the computer can generate all other tables required for studying the epidemiology of malaria in various villages in the various parts of the district from the data fed from this format generated at HSC level.

15. Building up suitable data base for number of years will help in analysis of the data over a period of time. Matching this with the intervention measures is possible if the intervention measures like insecticidal spray, anti larval operations etc. are also collected and made use of. Formats for these are given in Annexure 1 to 8.

16. Formats for entomological data and information had been recently revised by directorate of NMEP. These were studied and found to be suitable for the present. But the need seems to be to organise a well trained core of public health entomologist at different echelons of public health services to undertake systematic studies and then specialised studies.

17. The contents of the forms developed should be subjected to periodic reviews for modifications, based on the experiences and informations generated by the dist. epidemiological cells, and feed back received from the research studies. (as per annexures at the end).

NOTE FOR USING FORM I

1. This form is to be written by every one who collects blood slides from suspected malaria cases. So the following categories of personnel will fill this form.
   a. Multi Purpose Health Workers - Male.
   b. Multi Purpose Health Workers - Female.

      i) during her field visits (ACD)
      ii) Fever cases calling at HSC for treatment (PCD)

   c. Multi Purpose Health Supervisors (during their field visits).
   d. Volunteers incharge of FEVER TREATMENT Centres.
   e. DISPENSARIES/OUT-PATIENT SERVICES OF PHC Hospitals, Inpatients in Hospitals.
   f. Private medical practitioners.
   g. By staff engaged in Mass Survey (e.g District Epidemiological Cell).

   Multi Purpose Health Worker Male will keep an upto date list of "Passive agencies" in various villages of his area and contact them periodically to (a) motivate them in this activity, (b) collect their blood smear collection and form no.1 (F.1) duly filled by them, and then completing the other particulars not noted by passive agency from his FAMILY REGISTER, and arrange to send the Blood Slides to the Health Centre for Blood Smear Examination.

   The periodicity and mode of sending Blood Smear collection to PHC or any designated laboratory will be as per time to time instructions from Medical Officer of the Primary Health Centre or District Health Officer.

2. At the Primary Health Centre, the Medical Officer, Primary Health Centre will cause the F.1 received with Slides checked for filling up of Columns 1 to 8 then arrange to have the Blood Slides satisfactorily stained and carefully examined and then cause the results of examination noted in Columns 9 to 14. Column 14 is date of communication of result from PHC to Radical Treatment administrator. Where the laborary directly receives the BSC, the concerned L.T. checks whether cols. 1 to 8 had been duly filled by MPHW/Passive Agency, and bring to the notice of MPHW any deficiency.

   (In some States, the R.T. is given by Health Workers, in some other States by the Health Supervisor, so the term R.T. Administrator is used).

   Where R.T. administrator is Health Supervisor then he shall cause (a) results of BSE to be noted by Multi Purpose Health Worker, in his copy of FI Col. 9 to 14 and the R.T. date of respective Patient (Co. 15-17) (b) Enter R.T. particulars in the P.H.C. Copy (Col. 15-17) (c) will arrange through MPW to inform each passive Agency about a positive case from his/her BSC (to maintain a high motivational level in the Passive agency). The Passive Agency may be a FTC or Dispensary or a Private Medical Practitioner.

3. Date of R.T. administered will be noted in Col.15-17 by R.T. provider, in his copy of FI and later he will use this form to follow up this patient. In case of death of the patient, he will note date of death in Col.18 and inform M.O. PHC of this death for MO's investigation and note in Col.19 the cause of death as decided by M.O.

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4. The MPHW (M/F) who comes to know of death of any person whose BSC was taken within the last one month, shall note this death in their F1(Co.18) and intimate the supervisor (M) and M.O. PHC.

5. Co. 19 can be used to mention if the patient is a visitor to that house; and if that patient turns out to be a positive case then details of his/her source of malarial infection can be noted.

6. All enteries by every personnel is to be in BLOCK letters to facilitate easy READABILITY.

sions

As noted earlier, information systems must be planned, implemented and ted. This applies to the management of the routine monitoring segment of alth information system as well as it does special surveys and operational ch carried out with the aim of improving upon the knowledge of malaria alaria control activities.

The responsibility of recognizing the quality and capabilities of routine oring and of deciding where and how to strengthen it falls upon the district with active support of the higher levels of the health system. The steps should be followed in general planning (orienting), implementing and ating routine monitoring are showing in Figure are a generic process is ed which clearly must be adapted to meet the specific managerial practices ch State/District. This process assumes that where routine monitoring s inadequate site-specific training courses and workshops, enhanced case- gement tools, guidelines and standardized diagnostic, treatment and referral ion.

It is not expected that routine monitoring will be able to provide all of the mation needed for malaria control. Alternative means for gathering mation will be needed whether in the form of special sites, special surveys ecial studies (operational research). Here too, a managerial approach should llowed. The outlines schematically a process to be adapted to local mstances.

Routine monitoring

PLANNING:

1. Determine important malaria problems in each administrative unit of the District.
2. Define principal control objectives and activities.
3. Define which key indicators are required to monitor effects of service procedures and control activities and include in montoring plan.
4. Identify important errors in patient management which influence monitoring of key indicators and identify, where possible, tools and guidelines which would enhance patient care and subsequent monitoring.
5. Consider alternative monitoring approaches if routine surveillance, despite strengthening, cannot fulfil needs (see below).
6. Define budget, sources of tools and guidelines, timetables, workshops, accountable staff, job responsibilities, training courses.
7. Make plan of action for implementation and local evaluation.

IMPLEMENTATION:

1. Discuss and distribute plan of action for updated routine monitoring of key indicators within the framework of improved service procedures, patient care, and control interventions.
2. Request feedback from accountable staff on proposed improvements in tools, guidelines, surveillance approaches, and identify local application needs.
3. Ensure local staff receive adequate training (e.g., through workshops in each administrative unit) on use of new tools, guidelines, charts, and other methods of implementation; and on evaluation and interpretation of their own statistics, with clear directives when to alert District team of important events.
4. Test effectiveness of updated service procedures after trial period and modify serious errors.

EVALUATION:

1. Evaluate effectiveness of new tools, guidelines, service procedures, and other control interventions in each administrative unit of the District through gathering of locally analysed monitoring data.
2. Identify problems with enhanced approaches and feasibility of longer term maintenance.
3. Where necessary and available, validate results against information obtained from alternative monitoring approaches. Refine tools and guidelines, and reasses viability of indicators and monitoring methods according to results.
4. Continue surveillance process, in a dynamic manner, taking into account changes in epidemiology of malaria, improved service procedures, and new control interventions.

Special sites and surveys

PLANNING

1. Determine which key indicators, unobtainable from routine monitoring, are required to monitor service procedures and control interventions.
2. Determine if key indicators can be representatively obtained from sentinel sites or surveys and determine period of monitoring required.
3. Set up working group to devise survey methods, identify best sites, survey techniques, and to define responsible persons and lines of communication.
4. Define budget, staff, collaborators, outputs required for procedure.
5. Define accountability and job responsibilities of local staff, and training needs.
6. Make plan of action for implementation and evaluation.

IMPLEMENTATION

1. Hold workshop to train accountable staff, define local needs, form links with participants.
2. Discuss and distribute plan of action and protocol at special sites.
3. Request feedback from staff participants on proposed tools, study design and implementation.
4. Implement pilot study in select sites; test feasibility of study.
5. Evaluate results of an interm pilot, contact relevant staff to adjust methods, responsible staff, timetable, budget.
6. Implement study proper.
7. Coordinate with health staff and research collaborators to ensure smooth running of study.

EVALUATION

1. Evaluate effectiveness of service procedures and control interventions in each administrative unit where special sites or surveys are under implementation, through analysis of indicators generated through study.
2. Identify biases and problems with methodology, including tools, feasibility of sites, study methods, accountable staff, and proposed indicators.
3. Assess budget requirements and redefine future resource requirements.
4. Compile analysed data and compare with information obtained from routine surveillance conducted in same administrative units.
5. Redefine necessity of repeat/periodic use of survey or site, as alternative/complement to routine surveillance in terms of cost-benefit.
6. Set up Plan of Action for future monitoring management.

IMPLEMENTATION OF REVISED MALARIA CONTROL STRATEGY

1. Intersectoral coordination
2. Integration of malaria control
3. Training, education and supervision
4. Reorientation
5. Community participation

CHAPTER 11

IMPLEMENTATION OF REVISED MALARIA CONTROL STRATEGY

There are many sectors that are directly related to the successful implementation of malaria control programme in health, education, irrigation, forestry, engineering, social and tribal welfare, urban development, fisheries, etc. Modes and mechanisms for development of intra and intersectoral linkages and coordination between these sectors at different levels of operations i.e. centre, state, district, sub-district, block and local are of paramount importance. Identification of various sectors of health, education, irrigation, agriculture, forest, social and tribal welfare, fisheries for intra and intersectoral cooperation and coordination is extremely essential. The urgency of establishing firm collaboration among various agencies and departments connected with the activities of malaria control in urban, rural and tribal areas has since been recognized, there is a need to make this collaboration effective by forming a coordination committee to coordinate their activities. The district epidemiological cell should be an active partner of the coordination committees to make all intersectoral coordinations more meaningful and effective in field operations. The coordination committee should also prepare guidelines for health education activity and generate effective community participation. Role of each sector needs to be defined by the state governments/coordination committees, and the areas of work and actions required should also be determined based on the district level microplanning of malaria control.

Major areas of action/coordination for engineering works

As a model of intra and intersectoral coordination, categorization for major and minor engineering works for mosquito control activities is presented below. Plans for such works should be prepared with priority and time schedule for other activities requiring intra and intersectoral coordination.

Intra-sectoral works

The natural water courses of big drains require the following activities :

- Desilting and cleaning large drains before and after monsoon
- Periodic cleaning during other months
- Periodic clearing of marginal vegetation

The roadside open channel drains require following works :

- Surface drains should not be covered, as far as possible, as it renders the contents inaccessible to larvicidal treatment
- Proper precautions should be taken to give a satisfactory gradient, wherever possible, during construction to prevent water stagnation and mosquito breeding
- Open channel drains should be cleaned periodically to remove garbage, and to facilitate effective larviciding

Laying of underground sewers

- Plans should be drawn up for bringing affected/endemic areas under sewerage system on a priority basis. Priorities should be fixed for a phased programme in consultation with the health sector

Faulty connections to storm-water drains in urban areas

Faulty connections of sewer to storm water drains should be surveyed and eliminated to keep storm-water dry during the fair season

Effluent of sewage pumping stations in urban areas

Effluent of the pumping stations should be trained up to the final disposal point to avoid deliberate deviations

Surveillance and vector control

Disease surveillance and vector control operations, where implemented by independent agencies, should be coordinated with reference to disease incidence and vector occurrence, for effective control

New works and building constructions in urban areas

- Municipal engineers should scrutinize building plans to ensure elimination of water accumulations in or on the structures.

- Construction of fountains, garden and surface wells should not be encouraged as a policy

Large establishments such as port trusts, defence enclaves and railways

- These establishments should earnestly strive to give effect to municipal requirements on various matters such as installation of standard pattern cisterns and mosquito proofing of wells

- Vector control work should be coordinated with and, if necessary, under the guidance of municipal bodies and district epidemiological cell

Irrigation canals, channels and dam sites

- Prevention of water seepage from dams should be ensured.

- Proper gradient of irrigation, canals and channels should be maintained throughout. Special attention is required in command areas.

Logistics

Logistics cooperation between cities/States should be effectively established to deal with epidemic emergencies

tersectoral Works

Reclamation of low lands/marshes

- Agencies undertaking the works should furnish plans to the district health authorities/district epidemiological cell for approval

- While reclaiming lands, the agency should ensure that natural water courses and tidal movements are not affected

- Pockets of low-lying portions should not be left to allow water to stagnate

Embankments

- Culverts of adequate size and in sufficient number should be provided across embankments.

- The culverts should be periodically cleaned to maintain flow

Lowlands, ponds and borrow pits

- Extensive lowlands, large ponds and borrow pits should be filled in by garbage, as each filling is expensive. This could be done in areas away from residential localities and during the fair season

Maintenance of properties

- The various agencies should ensure that leaking house drains are repaired and water accumulations prevented

- The cisterns should be accessible and mosquito proof

Stone quarries

- The authority governing the activity should ensure that quarrying is not done below the surrounding ground level, to avoid creation of permanent and large mosquito breeding places.

Irrigation, canals, channels and dam areas

- While constructing dams the authorities should keep the district health authorities/epidemiological cell informed about the plan of activities associated with dam construction activities and labour movement.

- Voluntary agencies should actively participate in surveillance and control activities around dam site.

- Coordination committees should ensure proper gradients of irrigation canals and channels and prevent seepage of water from dams.

- Agriculture, irrigation and health sectors should actively cooperate in their combined efforts to control breeding of vectors in these irrigated areas.

Training and Supervision

Training must be cost-effective, and thus integrated training activities are preferable to having each individual programme area run its own training courses for the same people on different occasions. However, it is recognized that training is an area in which there are failures and, moreover, the more successful candidates are often promoted and therefore leave the position for which they were trained. If the impact of these losses on the control programme is to be reduced, a long range training plan is required which includes not only the basic training of new staff but also the retraining and reorientation of existing staff.

One of the problems repeatedly identified by malaria experts is the shortage, at all levels of the health care system, of staff with an appropriate knowledge of malaria and its control. Even if funding of antimalaria activities is increased the functional capacity of programmes is related, in part, to the availability of well trained and motivated staff.

The implementation of the new malaria-control strategy within the context of primary health care requires both a reorientation of the approach to malaria problems as well as the mobilisation of resources from the general health services. This has created the need for significant changes in the area of malaria manpower development and a strong need for retraining.

In order to meet current training needs, a number of specific actions should be taken. The first step is to review the antimalaria approaches at all levels so as to identify areas of manpower excess and deficiency. The latter may be in the number of individuals available to perform a particular function or in the level of skills or knowledge of those already working on malaria problems. Excesses may be the consequence of a maldistribution of personnel in relation to the severity of the malaria problem in different areas or to the availability of more personnel than are required in different areas or to the availability of more personnel than are required in a particular job category in the light of the new strategy. Both of these problems may be addressed by redeployment of staff and/or changes in their functions. When these manpower problems have been identified, specific training activities can then be developed to address them.

At the same time as there has been a major shift in the strategy for dealing with malaria, there have also been a number of important changes in the philosophy and techniques of training in general. some educational approaches used in the past are now perceived as being less appropriate. for example, lectures are now less frequently used and are increasingly being replaced by small group teaching focusing on problem analysis and solution development. Training for malaria control, whether basic or refresher courses, should also focus on developing the flexibility necessary to respond to the different malaria situations found in each area.

Workshops and seminars are particularly suitable for staff reorientation, since they permit a freer exchange of ideas and greater interaction between the participants and the instructors in finding solutions to the problems presented by malaria. In addition, greater emphasis needs to be placed on the use of case studies, which can be used to illustrate the experiences of malarious countries in dealing with their malaria problems. Their use can promote the process of problem analysis and solution development and will encourage an interchange of ideas on the best way to reduce the impact of malaria. To improve training in malaria control, the training of trainers is recommended; this will provide the responsible staff with the necessary skills to develop relevant and practically orientated malaria training in their country.

Continuing education is essential for all categories of health personnel, including the core of specialists who are expected to guide the health services. They need to keep abreast of the changes in technologies, methods and approaches and, in turn, there is a need to make appropriate changes and adjustments to the training curricula of the other categories of workers. Some mechanism needs to be devised to keep all health workers well informed. At present, they generally do not have easy access to the scientific literature particularly since the charges for subscriptions to journals and the cost of books are rising rapidly and have to be paid in foreign currency. The district level perhaps suffers the most from lack of information and yet this is the most important level for malaria control. However, in several countries circulars and manuals are provided and updated by the health ministry and help to fill the gap.

Supervision is an essential component of any programme and should be a method of continuing education and retraining and not a punitive system. Standards of work can be evaluated and errors and deficiencies corrected through direct personal contact. Indirect methods, such as reporting and evaluation, can be used to identify health workers who are in need of retraining, and they can then be sent on refresher courses organised for this purpose.

Logistics : Programmes need to estimate and plan for essential commodities, in particular drugs, and follow a routine cycle to ensure procurement and distribution. The expected drug need should be based on the estimated malaria morbidity and priorities established with respect to type of drug and formulation (1st, 2nd and 3rd line). Costs of all commodities need to be estimated, sources of good quality materials identified, funds secured and supplies procured. The receipt, storage and distribution are critical to the logistics cycle. Distribution should be safe (minimal loss from damage and pilferage) and stored under good conditions. Schedules should be established for advance supplies of drugs to areas and for periods of high risk. Systems need to be established which respect expiry dates by rotation and that set minimum levels at which requisitions are made (usually 3 months supply).

The essential antimalaria drugs should be part of the national essential drugs list, at the right level of care, and this implies that the national malaria experts and the national malaria control programme should decide, with the national formulary committee, what the most essential antimalarials are, and how they should be used. In these discussions WHO information and advice should be taken into consideration. The outcome of these discussions should be that the selected antimalarial drugs are included in the national essential drugs list, the drug budget, the drug supply system, the treatment guidelines, the training programmes and the supervision activities. This is exactly what is done in several countries by the national programmes on HIV infection and sexually transmitted diseases, diarrhoeal diseases, respiratory tract infections, schistosomiasis and others. Many countries now have nationally prepared sets of treatment guidelines, which include all major disease groups, with integrated training and supervision programmes at the district level. In many cases the development of these integrated training materials and implementation of the combined training programmes are coordinated by the national essential drugs programme.

There is a problem on the supply side. Nearly all national disease programmes, including malaria control programmes, come to the same conclusion: the MOH drug budget is by far not sufficient to satisfy the needs of all national programmes and to procure the necessary quantities of the carefully selected essential drugs. This may result in a situation where health workers are taught to use drugs that are not available in the system.

Long term (5 years) projections of insecticide requirements based on programme objectives and targets, need to be established and insecticide availability assured. A strategy which includes the selective use of insecticides and a reduction in existing usage, will have long term cost implications for those insecticides which are used mainly in public health. This is important for future programme budgetting and planning. The variability of the malaria distribution and epidemics can be expected to increase and thus provision will have to be made to ensure the rapid mobilisation or availability of resources, including insecticides.

Reorientation : Among the elements which are important for reorientation are : evaluation, change and expansion of the responsibilities and job definitions of malaria control personnel; reorientation of entomological services, intersectorial approach; and documentation of experiences.

It is necessary to plan the decentralisation of decision-making and of use of resources etc. Decentralisation of execution of activities has to be done in different ways according to the risks involved, and the possibility for building decision making capacity at the periphery. Provincial meetings for policy, planning etc. can be organized to provide a plan to reinforce capacities at the periphery.

The main task is to ensure decision-making capacity in the health services, so that the programme can be reoriented in a responsible way. If spraying is stopped this is the opportunity to get the general health services to take over responsibility and empower them to do so by integrating malaria staff into their structures. Malaria staff will then for example find their place in polyvalent teams responsible for with epidemiology and hygiene. Their special skills may be of benefit for the control of a range of communicable and vector borne diseases.

It is important to review legislation, which in many countries prevents reorientation. Many have legislation to prevent spraying by none professionals. In the Americas, WHO is working with parliamentaries on revision of general health related legislation.

It is very important to strengthen emergency preparedness, ability to react when needed. Also in this respect capabilities for responding to various diseases can be strengthened in a coordinated way. This will facilitate the possibility for having the necessary supplies and the necessary specialised supervisory staff present where needed in the case of an epidemic.

Community participation : To be effective and sustainable, a vector control programme must be part of the national general health programme, and should be based on the availability of skilled manpower and on actual community participation.

Planning and implementation of proposed operations must take into consideration social as well as biological and environmental factors. Health managers must understand the social-cultural thinking of the population regarding the relationship of "mosquitos" to "diseases" and the perceived benefits they could obtain through a vector control programme.

Some recent surveys in India have shown that :

- malaria is considered the most important of all diseases by the population, but there is a large discrepancy between their claim and "malaria" as determined by physicians;

- most people are aware of the fatal risk of malaria but if they link mosquito and bite, fever and malaria, they do not always link mosquitos and malaria fever, particularly for cerebral malaria which is often thought to be of supernatural origin.

- the advantages obtained with bednets are felt in terms of protection against bites, far more often than against :disease".

Presenting any vector control measure to the population mainly as a fight gainst nuisance insects and not only against the disease itself will result in reater compliance.

This point underlines the need for good collaboration between different lepartments when planning vector/malaria control and the need for intersectorial coordination. The above information also shows that there is no single solution applicable everywhere with the same expected efficacy.

Non-governmental organisations have an enormous potential to lead the community for control activities. This should be harnessed.

ANNEXURES

1.	North Eastern States	:	1 to 6 (Page 1-108)
2.	MIS Forms	:	7 to 15 (Page 109-122)

Annexure - 1

Nagaland

Information from States required for Task Force

1. Maps of the State showing

   - Geographical features
   - Zones and Districts with their H.Q.
   - High incidence Districts marked with colour

     1990 API, ABER, PF% in each District
   - Pf. Resistance foci
   - Areas under insecticide spraying Malathion, BHC, DDT mark by colour
   - Vectors if more than one.

2. Total area of the State in Sq. Km.
   Percentage of State's total area

   - Hill area sq. km. 16,579 Sq Km
   - Forested area sq. km. 8625.32 Sq Km
   - Cultivated area in hectars 2,00500 hect
   - Rice cultivated area in hectars 1,27,400 hect
   - Irrigated area in hectars 54860 hect

3. Metcorological Data for last 5 years
   (month-wise statement can be furnished)

   - Average rainfall, Highest and Lowest 250 mm, 490.4 mm 13.0 mm.
   - Main rainy season (months) May to Oct (6 mts)
   - Mean temperature, Maximum temperature and Minimum temperature. 18.7°C, 36.4° to 2.0°C

4. - Altitude range in the State 194 to 4000 meters.
   - No. of major/minor/medium and lakes

     Give location District/PHC-wise.

5. Demographic Data

Total Population (as per 1991 census)

Rural 9,48,351

Urban 2,38,591

Tribal 11,86,942

Sex ratio State as a whole

in Rural area 890 : 1000 Males

in Tribal area

Density of Population

In whole State 73/Sq Km

in Rural area

in Tribal area

Literacy rate	Rural	Urban	Tribal
Male	66.09 %		
Female	55.72 %		

6. Brief history of Malaria programme in State highlighting current situation of Malaria in the State.

7

7. Organisational Data

Please give organogramme for State, District, PHC.

	Whole state	Tribal
No. of Divisions	32	32
No. of Revenue districts	7	7
No. of Malaria districts or units	1	1
No. of Blocks	21	21
No: of Towns and Cities	29	29
No. of villages	1109	1109

8. Health institutions

		State	Tribal area
1. No. of Hospitals		31	31
2. No. of Dispensaries	Govt.	65	65
	Local Body		

	State		Tribal	
	Required as per norm	Functioning	Required as per norm	Functioning
CHC		4		4
PHC		29		29
Sub centres		234		234
FTDs		NIL		NIL
DDCs		81		81

National norms for institutions and staff enclosed.

9. Staff Position as on 1.9.92

Name of Post	No. required as per norms of Govt. of India	No. sanctioned	Vacant	In Malaria trained or not trained	Pay scale	Remarks
9a State level						
State Programme Officer	1	1	NIL	—	1410 — 2480/-	
State Entomologist		1	"	TRAINED	1175 — 2385/-	
Other offices and staff at HQ such as Clerks, Accountant, Lab. Tech. Statistician etc. give category-wise	Supld — 1	1	"	—		
	SK & UDC - 1	1	"	—	690 - 1275/-	
	Typist — 1	1	"	—	510 - 895/-	
	Driver — 1	1	"	—	425 - 730/-	
	Peon — 1	1	"	—	375 - 590/-	
9b Zonal level						
Zonal Officer Malaria	2	2	"	† TRAINED	1175 - 2385/-	
Zonal Entomologist	2	2	"	TRAINED	930 - 2080/-	
Lab. Technician	4	4	"	"	600 - 1275/-	
Insect Collectors	4	4	"	NOT TRAINED	450 - 805/-	
Drivers	2	2	"	"	425 - 730/-	
Other Staff						
9c District						
CMO/DCMO						
Dy. CMO/DCMO						
DMO	1	3		1 TRAINED	930 - 2080/-	
Asst. Malaria Officer	1	3		NOT TRAINED	690 1590/-	
Malaria Inspectors	8	22		"	535- 920/-	
Lab. Technicians	29	13		"	600- 1275/-	
Insect Collectors		37		"	425- 730/-	
Drivers	SI = 32 SW = 125 S.F.W = 2 F W = 5	244		"	375- 590/-	
Other Staff	Driver	35		"		
		3		-	450- 805/-	

9. PHC Staff Position as on 01-9-92

9d Name of post	No. required as per norms	Sanctioned	Functioning
1. Medical Officer	29	29	25
2. Lab. Tech. Asst.	29	29	15
3. L.H.V.	29	29	58
4. A.N.M.	29	29	
5. Health Supervisor / Health Asst.) Male			
6. M.P.W. Male			
9e Village health guides			
9f No. of ICDS Blocks	26	26	
No. of Anganwadi workers	2674	2674	

Norms of Government of Indian given in enclosure.

12. Financial Data

Year	Required as per technical need	Central allocation	State allocation	Provision made in State budget	Amount actually made avaialble by state during the year	Date of release of funds	Actual expenditure out of state funds			
							Total	Purchase of Insecticide	On employing spray teams	Other contingenc expenses
1985-86	(RURAL)	3.77	60.12	65.82	65.82		61.89		7.72	3.78
	(URBAN)	-	17.74	17.74	17.74		26.27			0.89
1986-87	(R)	12.12	82.46	85.05	85.05	1-12-86	75.59		10.19	7.61
	(U)	0.31	13.54	16.36	16.36		20.64			1.32
1987-88	(R)		81.94	91.08	91.08		79.79		13.71	6.34
	(U)		17.36	8.75	8.75		22.89			2.41
1988-89	(R)		92.20	100.70	100.70		80.15		14.97	4.29
	(U)		8.00	9.24	9.24		24.15			0.73
1989-90	(R)		96.00	96.00	96.00		89.80		15.21	6.51
	(U)		8.00	8.00	8.00		24.61			0.47
1990-91	(R)		85.50	102.29	102.29		89.91		16.20	7.35
	(U)		10.50	10.50	10.50		20.93			0.34
1991-92	(R)		82.90	82.90	82.90		102.77		21.01	8.19
	(U)		19.00	19.00	19.00		27.07			0.58

Give separatley a note on the constraints you experience in timely release of funds (during last 3 years (1990-92)

14. STATE SPRAYING DATA

Year	Rounds	Total Pop.	Pop. of Area 2 API & above	Pop. projected for spray	Pop. covered	Period of Spray From	Period of Spray To	Achievements Targeted Rooms	Achievements Targeted CS	Achievements Sprayed Rooms	Achievements Sprayed CS	% coverage Rooms	% coverage CS	Insecticide consumed MT
1985	2	986259	6,56723	656723	500305 493343	MAY	SEPT	344726	7277	251256 263633	6110 6747	72% 76%	95% 93%	98388Kg
1986	2	993611	597798	597798	442020 416862	"	"	345676	9357	254344 206319	6645 5347	73% 60%	73% 62%	91388 Kg
1987	2	1011530	626566	626566	416440 426422	"	"	414567	8256	232907 247463	6046 7075	56% 60%	75% 85%	77303Kg
1988	2	1012520	606066	606066	410017 424698	"	"	397182	7212	299492 295291	5767 6665	75% 74%	82% 92%	76339Kg
1989	2	1015749	615200	615200	443299 459749	"	"	450201	9967	331239 411871	9204 9241	73% 91%	92% 98%	67907Kg
1990	2	1043316	472911	472911	378166 326029	"	"	257330	10901	208016 160649	9026 7144	80% 62%	83% 65%	71213Kg
1991	2	1235067	696357	696357	500611 386923	"	"	378090	13774	264349 205343	9954 7553	70% 54%	72% 57%	79896 Kg.

A similar information in separate sheet for each District and each PHC.

13. EPIDEMIOLOGICAL DATA (1985 to 1991)

State: NAGALAND.

Year	Population	B.S. collected	B.S. Exd.	Total +ves	PF.	ABER	SFR	API	PF%	%RT Given	No. of cases in age group		Remarks
											01	1+4	Deaths /
1985	986299	59548	59548	5163	1377	6·03	2·3	5·23	26·6	100%	15	115	NIL
1986	993611	58810	58810	6317	2022	5·9	3·4	6·3	32·0	100%	17	125	NIL
1987	1011530	41828	41828	6760	2053	4·13	4·9	6·6	30·3	100%	21	139	NIL
1988	1012520	40904	40904	3477	849	4·03	2·07	3·4	24·4	100%	7	111	NIL
1989	1015749	44619	44619	3066	873	4·3	1·9	3·01	28·4	100%	6	113	NIL
1990	1043318	37299	37299	2396	580	3·5	1·5	2·2	24·2	100%	7	101	NIL
1991	1235667	41714	41714	2643	606	3·3	1·4	2·13	22·9	100%	5	120	NIL

Similar data for District/PHC

15. Logistics data

Vehicles

	No. required as per norms (M.P.O.)	No. available	On Road	No. required as replacement
Jeeps	4	4	2	2
Pick-ups	1 P.U + 2 Truck	3	NIL	3
Motor cycles	8	2	NIL	8

Give separately for State HQ, Zonal level, District level, Zonal entomologist

Microscopes	No. required	No. available	No. Out or order	New required
for States & District-wise	28	23	6	11

Microglass slides State level	Annual requirement.	Procured
1989	860 gross	500 gross
1990	860 gross	500 "
1991	860 gross	800 "

Spray Pumps	Required	Available	Procured
1989	120	40	80
1990	120	50	40
1991	120	65	60

Anti Malarials	Required	Supplied by Govt. of India	Consumed
4 AQ			
1989	5 lac	5 lac	5 lac
1990	5 lac	5 "	5 "
1991	5 lac	5 "	5 "

80[illegible] tablets	Required	Supplied by Govt. of India	Consumed
1989	2 lac	2 lac	1,80,00
1990	2 "	"	1,80,00
1991	2 "	NIL	40,000

Quinine Ampules Give availability and Distribution list for two years 1990, 1991.

1990 2500 amps procured

1991 " " "

Insecticides	Requirement	Procured	Supplied by Govt. of India	Consumed
1989	100 MT	100 MT	100 MT	100 MT
1990	100 MT	100 MT	100 MT	100 MT
1991	100 MT	100 MT	100 MT	100 MT.

10. TRAINING

Give Malaria training status of following staff:

Category	Total No.	Trained	Where	Untrained
- Medical Officers	4	2	NICD, Delhi	2
- Multipurpose supervisors Male				
- Multipurpose supervisors Female				
- M.P.W. Male				
- M.P.W. Female				
- Lab. Technicians	22	10	RHFW, SHILLONG	12
- Malaria Inspectors	22	—	—	22
- Entomologists	2	2	NICD, Delhi	—
- Malaria Officers	3	1	NICD, "	2
- Asstt. Malaria Officers	3	—	—	3

11. Please list the training facilities available for training and retraining the various categories of post:

11.1 Male MPHW
11.2 Laboratory Technicians
11.3 MPHA - Male
11.4 MPH Worker (Male)
11.5 MPHA (Female)
11.6 MPHW (Female)
11.7 Malaria Inspector
11.8 Medical Officer

Except refresher's Course no other Training facility is available in the State.

STATE N.M.E.P.

ORGANISATIONAL DATA

Name of State : NAGALAND.

State Data

1.	Population of 1991 census	=	12,15,573
2.	Number of Divisions/Zones	=	
3.	Number of Districts	=	7
4.	Number of NMEP Units	=	15 (IRC's)
5.	Number of Blocks	=	21
6.	Number of PHCs	=	29
7.	Number of Villages	=	1109

Tribal Data
(Based on Tribal Sub-plan, Government of India)

1.	Population of Tribal Area	=	11,86,942
2.	Number of Tribal Districts	=	7
3.	Number of Tribal Blocks	=	21
4.	Number of Tribal PHCs	=	29
5.	Number of Tribal Units	=	
6.	Number of Tribal Villages	=	1109

Staff Position under State NMEP (as on 1.9.1992)

Sl. No.	Category	No. Sanctioned	In Position	Vacant (%)
1.	State Programme Officer (Malaria)	1	1	NIL
2.	State Entomologist	1	1	"
3.	Zonal/Divisional Medical Officer (Malaria)	2	2	"
4.	Biologist	1	1	"
5.	Distt. Malaria Officer	3	3	"
6.	Asst. Malaria Officer	3	3	"
7.	Zonal Entomologist	1	1	"
8.	Malaria Inspector	22	22	"
9.	Laboratory Technician	22	22	"
10.	Insect Collector	14	14	"
11.	Multipurpose Worker (male)	244 (SW)	244	"

STAFF POSITION UNDER TRIBAL AREAS (AS ON 1.9.1992)

Sl. No.	Category	No. Sanctioned	In Position	Vacant (%)
1.	Zonal/Divisional Medical Officer (Malaria)	1	1	NIL
2.	Distt. Malaria Officer	3	3	"
3.	Asst. Malaria Officer	3	3	"
4.	Zonal Entomologist	1	1	"
5.	Malaria Inspector	22	22	"
6.	Laboratory Technician	22	22	"
7.	Insect Collector	14	14	"
8.	Multipurpose Worker (male)	244 (SW)	244	"

TRANSPORT POSITION

Transport position in State (as on 1.9.1992)

Type	No. required under MPO	Roadworthy	Off road	New required
Jeep	4	2	2	2
Jeep pick-up	1	NIL	1	1
Truck	2	NIL	2	2
Motor cycle	8	NIL	2	8
Any other				

Transport position in Tribal Areas (as on 1.9.1992)

Type	No. required under MPO	Roadworthy	Off road	New required
Jeep	4	2	2	2
Jeep pick-up	1	NIL	1	1
Truck	2	NIL	2	2
Motor cycle	8	NIL	2	8
Any other				

EPIDEMIOLOGICAL DATA

Epidemiological situation in the State

	1987	1988	1989	1990	1991
Number of Malaria cases	6760	3477	3066	2396	2643
ABER	4.13	4.03	4.3	3.5	3.3
API	6.6	3.4	3.01	2.2	2.13
SFR	4.9	2.07	1.9	1.5	1.4
P.f%	30.3	24.4	28.4	24.2	22.9
Deaths	NIL	NIL	NIL	NIL	NIL

Epidemiological situation in Tribal Areas

	1987	1988	1989	1990	1991
Number of Malaria cases	6760	3477	3066	2396	2643
ABER	4.13	4.03	4.3	3.5	3.3
API	6.6	3.4	3.01	2.2	2.13
SFR	4.9	2.07	1.9	1.5	1.4
P.f%	30.3	24.4	28.4	24.2	22.9
Deaths	NIL	NIL	NIL	NIL	NIL

SPRAY DATA
(as per the State NMEP policy)

DDT Spray Data (State)

1.	No. of Districts under DDT spray	7
2.	No. of PHCs under DDT spray	29
3.	No. of Sections under DDT spray	139
4.	Total population under DDT spray	6,96,357

DDT Spray Data (Tribal areas)

1.	No. of Districts under DDT spray	7
2.	No. of PHCs under DDT spray	29
3.	No. of Sections under DDT spray	139
4.	Total population (tribal) under DDT spray	696357

BHC Spray Data (State)

1.	No. of Districts under BHC spray	NIL
2.	No. of PHCs under BHC spray	NIL
3.	No. of Sections under BHC spray	NIL
4.	Total population under BHC spray	NIL

BHC Spray Data (Tribal areas)

1.	No. of Districts under BHC spray	NIL
2.	No. of PHCs under BHC spray	NIL
3.	No. of Sections under BHC spray	NIL
4.	Total population (tribal) under BHC spray	NIL

NAGALAND

SKETCH MAP
PHYSIOGRAPHY

N

RIVERS

Altitudes of some important Places (in metres)

29

NAGALAND

SKETCH MAP

MEDICAL INSTITUTIONS

(1989-90)

Map No 11 -

NAGALAND

INDO- MYANMAR 16-Km BORDER BELT

SECTIONS.

Based upon Survey of India map with the permission of the Surveyor General of India

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Annexure - 2

STATE N.M.E.P.

ORGANISATIONAL DATA :

Name of State : TRIPURA

State Data

1. Population of 1991 census = 27,44,827
2. Number of Divisions/Zones = nil
3. Number of Districts = 3
4. Number of NMEP Units = 1
5. Number of Blocks = 17
6. Number of PHCs = 51
7. Number of villages = 864 (Revenue village)

Tribal Data

(based on Tribal Sub-Plan, Government of India)

1. Population of Tribal Area = 8,36,823
2. Number of Tribal Districts = not declared
3. Number of Tribal Blocks = 5*
4. Number of Tribal PHCs = 27
5. Number of Tribal Units = not known
6. Number of Tribal villages = 462 (Revenue village)

* Out of total 10 Blocks, 5 are declared Tribal Blocks. In the rest 12 Blocks, more than 40% are Tribal population.

MALARIA OUTBREAKS

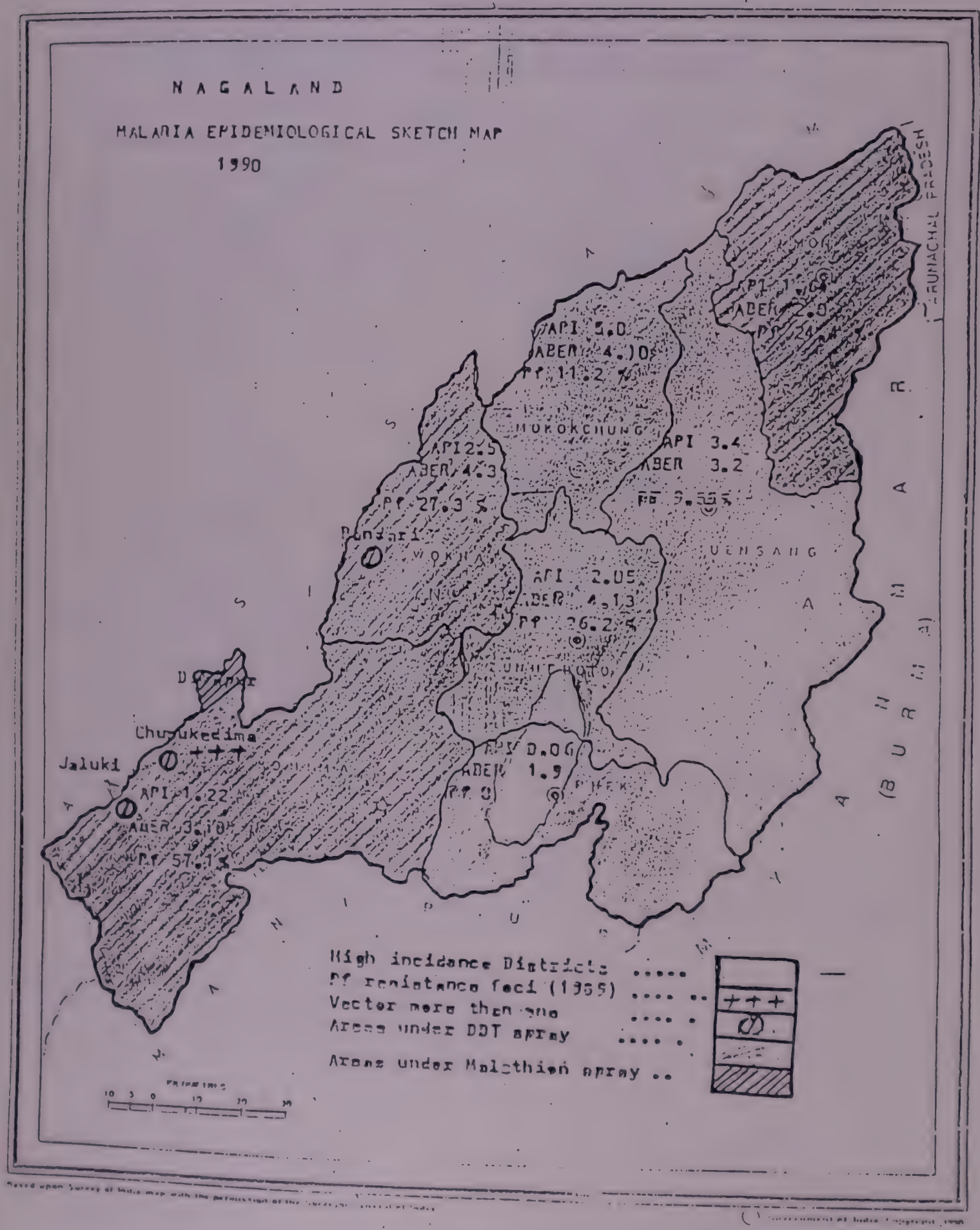
Focul outbreaks of Malaria in State (1987-1991)

Year	No. of Outbreaks in State/Tribal areas	No. of confirmed cases in State/Tribal areas
1987	1	20
1988	NIL	NIL
1989	NIL	NIL
1990	1	40
1991	NIL	NIL

NAGALAND

MALARIA EPIDEMIOLOGICAL SKETCH MAP

1990



Based upon Survey of India map with the permission of the Surveyor General of India

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TRANSPORT POSITION

Transport position in State(as on 1.9.1992)

Type	No. required under MPO	Roadworthy	Off road	New required
Jeep		5	5	0
Jeep pick-up(Van)		1	3	3
Truck		1	-	3
Motor Cycle		-	2	51
Any other- Maruty Gipsy				4

Transport position in Tribal Areas(as on 1.9.1992)

Type	Nol required under MPG	Roadworth	Off road	New required
Jeep				5
Jeep pick-up(Van)				5
Truck				3
Motor cycle				27
Any other -(Maruty Gipsy)				3

EPIDEMIOLOGICAL DATA

Epidemiological situation in the State

	1987	1988	1989	1990	1991
Number of Malaria cases	6187	6173	5991	6633	6992
ABER	7.0	7.2	7.7	8.7	8.3
API	3.3	2.5	2.4	2.7	2.5
SFR	4.2	3.0	2.2	2.4	3.0
P.f%	89.4	86.0	71.1	76.4	73.3
Deaths	5	1	5	4	7

Epidemiological situation in Tribal Areas

	1987	1988	1989	1990	1991
Number of Malaria cases	4550	4745	4405	5422	6793
ABER	8.4	8.1	7.43	9.53	8.9
API	4.13	3.3	2.9	3.66	3.16
SFR	4.16	3.56	3.36	4.03	4.56
P.f%	92.06	87.96	84.53	84.06	78.96
Deaths	1	1	4	2	3

SPRAY DATA

(as per the State NMEP Policy)

DDT Spray Data(State)

1). No. of District under DDT spray	3
2). No. of PHCs under DDT spray	51
3). No. of Sections under DDT spray	911(Gaon Sabha)
4). Total population under DDT spray	26.44 lac

DDT spray Data(Tribal areas)

1). No. of Districts under DDT spray	not declared
2). No. of PHCs under DDT spray	27
3). No. of Sections under DDT spray	317
4). Total population(Tribal under DDT spray	3,36,027

MALARIA OUTBREAKS

Focal outbreaks of Malaria in State(1987-1991)

Year	No. of outbreaks in		No. of confirmed cases in	
	State	Tribal area	State	Tribal area
1987	20	9	1341	406
1988	17	9	1098	419
1989	24	11	1421	623
1990	28	14	1225	520
1991	26	13	1303	674

Requirement of Laboratory Technicians(NMEP) :

Number of PHCs	=	51
Number of Lab.Tech available (NMEP)	=	26
Further requirement of Lab. Tech(NMEP) in each PHC	=	25

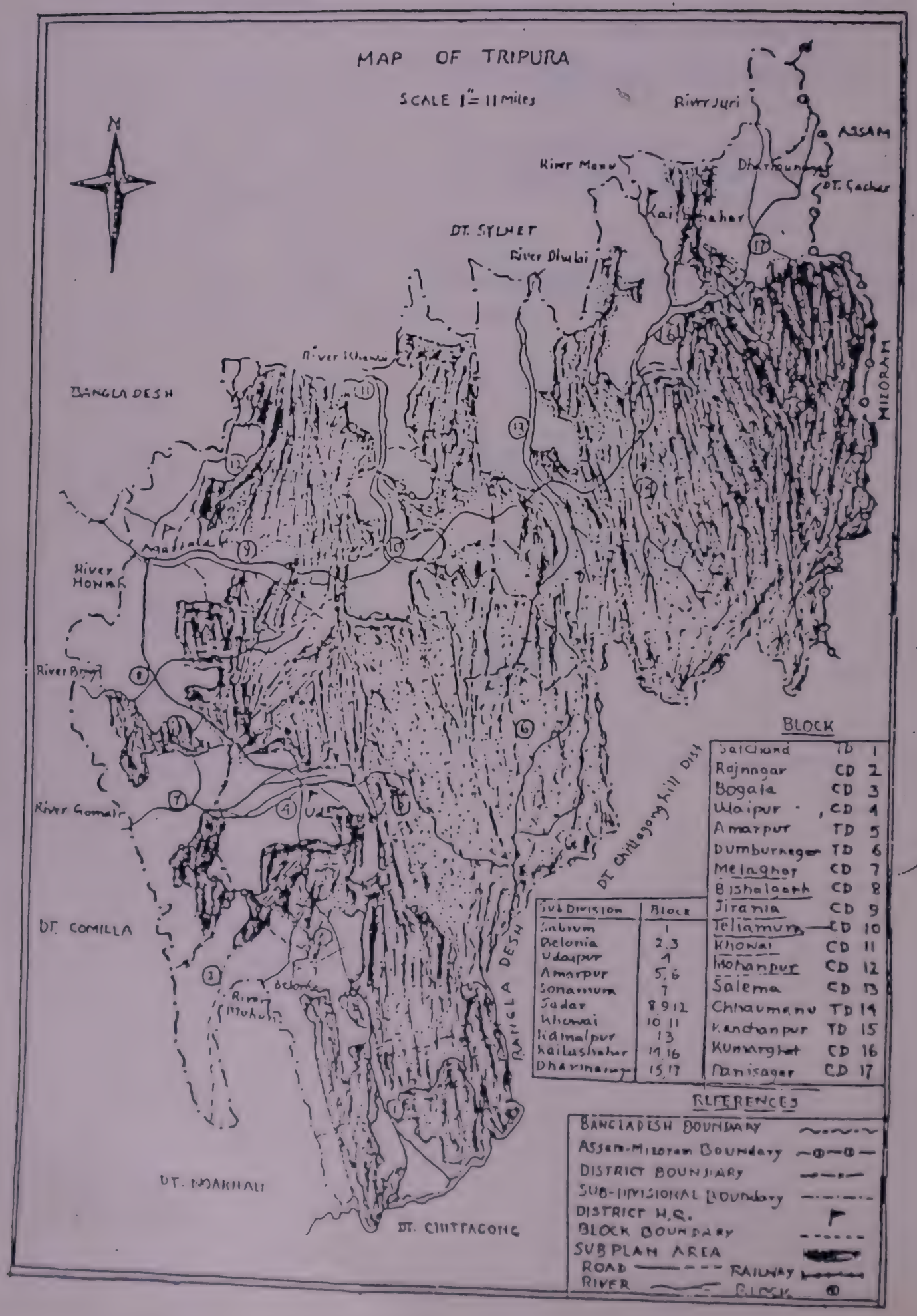
Requirement of Malaria Inspector :

Number of PHCs	=	51
Number of Malaria Inspector available	=	13
Further requirement of Malaria Inspector in each PHC	=	38

Requirement of DDT Spray Teams :

As per population of 1992 requirement of teams	=	172
As per population of 1981 concus, at present the number of teams available	=	149
So, further requirement of DDT spray teams	=	23

@CCC


MAP OF TRIPURA
SCALE 1"= 11 Miles
N
Rivr Juri
ASSAM
River Manu
Dharmanagar
DT. Cachar
Kailashahar
DT. SYLHET
River Dhalai
River Khowai
BANGLA DESH
MIZORAM
River Howrah
River Gomati
DT. COMILLA
DT. NOAKHALI
DT. CHITTAGONG
DT. Chittagong Hill Dist
BANGLA DESH
BLOCK
Jolchand TD 1
Rajnagar CD 2
Bogafa CD 3
Udaipur CD 4
Amarpur TD 5
Dumburnagar TD 6
Melaghar CD 7
Bishalgarh CD 8
Jirania CD 9
Teliamura CD 10
Khowai CD 11
Mohanpur CD 12
Salema CD 13
Chawmanu TD 14
Kanchanpur TD 15
Kumarghat CD 16
Panisagar CD 17
Sub Division | Block
Sabrum 1
Belonia 2,3
Udaipur 4
Amarpur 5,6
Sonamura 7
Sadar 8,9,12
Khowai 10,11
Kamalpur 13
Kailashahar 14,16
Dharmanagar 15,17
REFERENCES
BANGLADESH BOUNDARY
Assam-Mizoram Boundary
DISTRICT BOUNDARY
SUB-DIVISIONAL Boundary
DISTRICT H.Q.
BLOCK BOUNDARY
SUBPLAN AREA
ROAD
RAILWAY
RIVER
BLOCK

Annexure-3

INFORMATION FROM STATES REQUIRED FORTASK FORCES

STATE : MANIPUR

1. Maps of the state showing-

Enclosed separately as annexure.

2. Total area of the state in Sq.Km: 22,327

Percentage of State's total area

- Hill area Sq.Km : 90%
- Forested area Sq.Km: 90.01%
- Cultivated area in hectares(1991-92) : 149.62 (in thousand)
- Irrigated area in hectares : 70.62 (in thousand)

3. Metoorological Data for last 5 years

Rain fall average - Separate data enclosed.

Highest - 506.55 mm.

Lowest - 3.84 mm.

Main rainy season (months) - April to September

Contd/- - -2.

3.1 Meteorological Data

Average Rainfall in mm : monthwise/yearwise

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual average
1987	26.994	20.56	116.1	266.40	114.82	339.24	327.48	313.18	325.19	100.44	104.43	3.95	2045.95
1988	2.49	79.59	112.88	126.26	470.54	271.88	303.8	307.1	167.0	195.75	32.85	4.5	2007.08
1989	6.07	21.33	39.75	243.46	166.10	331.93	506.55	252.26	234.88	277.98	5.04	3.84	1885.73
1990	0.89	30.89	107.3	286.74	192.86	362.5	439.57	231.7	416.32	156.86	96.42	27.32	2054.48
1991	DATA NOT AVAILABLE												

N.A. : Not available

Source: Directorate of Economics & Statistics, Manipur.

3.2 Meteorological Data

Mean temperature, Maximum & Minimum Temperature
in degree centigrade
Monthwise, Yearwise 1987 to 1991.

Year	Status	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
1987	Max.	27.	26.1	28.5	31.7	33	31.5	31.0	31.8	30.3	30.5	28.1	23.6
	Min.	4.4	6.0	7.1	12.3	14.0	17.0	19.0	18.7	18.6	14.4	11.8	5.7
1988	Max.	23.7	25.8	28.1	32.2	30.0	31.5	27.8	30.6	31.5	31.2	28.7	25.8
	Min.	4.8	6.9	9.7	13.1	15.0	18.0	17.8	20.3	19.0	13.8	11.7	8.0
1989	Max.	23,5	25,8	27.0	31.6	32.3	32.7	32.5	31.4	32.0	33.5	26.5	22.2
	Min.	3.4	4.8	8.5	12.4	14.0	19.6	18.3	19.5	18.1	14.2	9.7	4.8
1990	Max.	23.6	25.3	28.4	28.0	31.8	31.0	30.5	32.6	30.7	25.5	23.6	24.9
	Min.	4.1	7.4	9.0	10.7	14.6	18.1	20.3	18.3	19.0	12.8	9.5	6.1
1991	Max.	23.5	25.2	28.0	28.4	31.6	31.4	31.0	33.1	30.3	26.0	24.0	23.6
	Min.	3.8	5.6	9.2	11.4	14.8	17.8	20.6	19.6	18.1	13.2	9.6	6.0

Sources: Directorate of Economics
& Statistics, Manipur.

4. Altitude range in the State:- Varies from 781 m to 2020.0m above MSL

No.of Major lakes : 3 (three)

Location District : Bishenpur & Thoubal Districts.

PHC Location : Moirang, Kakching.

No.of minor lakes : 3(three)

Location District : Imphal, Bishenpur Districts.

5. Demographic Data

Total Population as per 1991 census :- 1,826,714

Rural Population : 1625099

Urban Population : 200615

Tribal Population : 974577

Sex ratio

State as a whole

(Females per 1000 males) : 961

In rural area : 945

In tribal area : 930

Density of population per Sq.Km:

In whole state : 82

In Rural area : 149

In tribal area : 42

Literate population

Literacy(in number only)

Sex	Rural	Urban	Tribal
Male	291940	83067	160243
Female	181686	60879	103710

Contd. . . .

6. Brief history of malaria programme in state highlighting current situation of Malaria in state.

The control programme in the state of Manipur was started in the year 1953 with one unit strength. The eradication programme with 2 units was implemented in the year 1958. The whole area of the state was in the attack (0.25 units) and consolidated phase when Modified Plan of Operation was introduced in September 1977. No part of the state has ever been in the maintenance phase before. The Pf containment programme was started in October 1977 in the state till the closure of NCP.

Smooth implementation of programme is hampered from time to time in such difficult terrains and sensitive border areas of the state. The state of Manipur has a setback in the control of disease with the increasing trend in the malaria incidence during the year. Total of 194150 blood smears are screened in the year 1991 with the malaria positive of 640 and Pf of 325 respectively

There is an increase of 6.49% in total incidence with corresponding increase of Pf An 18.18% as when compared with 1990 data. The ABER recorded 10.62 with API of 0.3, there are good numbers of high incidence foci in the state.

The epidemiological picture is deteriorating during the current year with number of focal outbreaks.

The insecticidal spray is carried out in the selected high API areas along with Burma Bordering areas(BBA).

The failure in the control of disease is mainly due to the administrative and financial constrains. Number of post are lying vacant and fund is not available in time. The financial constrains indirectly hit the difficulty in procuring insecticides and antimalarials in time .

7. Organisational Data
ORGANOGRAMME FOR STATE,
DISTRICT PHC

ORGANOGRAMME

STATE : MANIPUR

HEALTH MINISTRY

SECRETARY HEALTH

Director Health

ASSISTANT DIRECTOR:NMEP

U.M.S.
Biologist- I
INSPECTOR-2
INSECT
Collector -2
S.F.W. -12
F.W. -36

N.M.E.P.(Rural
DISTRICT MALARIA OFFICER -3
ASSISTANT MALARIA OFFICER!3
MALARIA INSPECTOR -27
S.F.W. - 6
F.W. - 8
M.O. i/c NMEP - 3

ENTOMOLOGICAL CELL

ENTOMOLOGIST - I

DISTRICT MEDICAL OFFICER

MEDICAL OFFICER I/c PHC -NA
SURVEILLANCE INSPECTOR - 50
SURVEILLANCE WORKER -200
MICROSCOPIST - 24

7(Contd)

	Whole State	Tribal
No of Divisions	NA	NA
No. of Revenue Districts	8	5
No of Malaria districts or Unit	3	2
No of blocks	31	18
No of towns & cities	29 +I	IO
No of villages	2035	1902

8. HEALTH INSTITUTIONS

		State	Tribal area
I.No of Hospitals		20	7
2.No of Dispensaries	Government	52	4I
	Local Body	27	Nil
		25	25

	State		Tribal	
	Reqd as per norms	Functioning	Reqd.as per norm	Functioning
C.HCC	18	13	9	6
PHC	75	68	35	35
Sub Centres	420	420	22I	22I
FTDS		639		511
DDCs		643		430

9.Staff position as on I.9.92

Name of Post	No.required as per norms of Govt. of India	No sanctioned	Vacant	In malaria trained or not trained	Pay scale	Remarks
In State level						
State Programme officer	I	I	Nil	Trained	3000-4500	
State Entomologist	I	I	Nil	Trained	2250-3950 (Pre revised)	on adhoc
UDC/MMEP	8	8	Nil		1200-2040	
Accountant	75	24	Nil		950-1500	
Lab.Tech						
Statistical	I	NIL				

Cont				750-940
LDC/NMEP	4	4		750-940
Peon	IO	IO	Nil	750-940
SW	200	200	Nil	950-1500
Drivers		16	Nil	

9.b Zonal level

Not existing in the State of Manipur

9.C District					
CMO/DCMO	3	3	Nil	Not trained	
Dy.CMO/ DCMO			Nil		
D.M.O	3	3	Nil	Trained	2000-3500
A.M.O	3	3	1	- do -	1400-2300
Malaria Inspector	75	25	1	- do -	950-1500
Lab.Tech.	75	24	Nil	- do -	950-1500
Insect Collector	Nil	Nil	Nil	N.A	-
Drivers	NA	8	Nil	N.A	950-1500

Note: N.A: Not available

9. P.H.C. Staff position as on 1.9.92.

Detail informations not available.

10. Training

Give malaria training status of following staff

Category	Total No.	Trained	Where	Untrained
-Medical Officers	491	11+46 = 57	11 in MICD & 46 in MI & FWTC Imphal	434
-Multipurpose Supervisors(Male)	127		MI & FWTC Imphal	127
-Multipurpose Supervisor(Female)	01		-do-	01
- M.P.W.(Male)	336	Nil	N.A.	N.A.
-M.P.W. Female	507	507	Nurses & MPW Training Centre, Imphal	Nil
- Lab Techn. (MMED)	24	24	RMC,Shillong & RMC, Imphal	Nil
- Malaria Inspector	27	27	MI(MICD & RMC Imphal	Nil
- Entomologist	1	1	MICD,Delhi	Nil
- Malaria Officers	3	3	-do-	Nil
- Asstt. Malaria Officer	2	2	M.I. training at MICD(M/I) Delhi	Nil

11. Please list the training facilities available for training and retraining the various categories of post.

11.1 Male MPW

11.2 Laboratory technician

11.3 MPHA- male

11.4 MPW worker(Male)

11.5 MPHA(Female)

Facilities for training and retraining is available at Regional Health & Family Welfare training Centre,Porompat,

STATE: KARNATAKA

12. FINANCIAL STATUS

YEAR	Required as tch. need.	General allocation	State allocation	Provision made in State budget	Amount actually made available by state during the year	Date of released of funds	Actual expenditure out of fund			
							Total	Purchase of insecticide	On employing spray team,	Oth Con enc exp
							a			
1.	2.	3.	4.	5,	6.	7.	a.	b.	c.	
1985 1986		16.42	65.59	73.97	73.97	March/1986	11.91	-	2.17	9,7
1986 1987		53.11	67.87	71.50	71.50	Feb/1987	17.31	-	1.78	15.
1987 1988		57.61	72.52	70.74	70.74	March/1988	12.37	-	2.37	10.
1988 1989		85.73	82.61	81.38	81.38	March/1989	18.94	-	2.49	16.
1989 1990		57.46	79.54	79.71	79.71	March/1989	12.14	-	2.49	9.
1990 1991		78.44	58.44	39.31	39.31	March/1989	11.67	-	(CSS)	17.
1991 1992		41.35	47.67	47.67	47.67	March/1989	8.5	-	1.45	7

13.1

EPIDEMIOLOGICAL DATA
FOR THE YEAR 1985 to 1991

State: Manipur

Year	Population (lacs)	B.S. collected	B.S. Exam.	Total +ves	Pf	ABER	SFR	API	Pf%	%RT given	No.of cases in age group		Remarks/ deaths
											0-1	1-4	
1985	15.74	163618	163618	1166	690	10.4	0.42	0.74	59.2	99.9	17	44	1
1986	16.20	188665	188665	1778	904	11.64	0.48	1.1	50,84	99.7	62	6	4
1987	16.58	171314	171314	1084	353	10.33	0.20	0.6	32.56	100%	8	15	Nil
1988	16.64	186790	186790	1076	439	11.22	0.23	0.6	40.79	99.8	21	17	2
1989	16.96	195644	195644	957	397	11.53	0.20	0.5	41.48	99.7	8	8	2
1990	17.34	194568	194568	601	275	10.65	0.14	0.3	45.75	99.8	1	7	1
1991	18.26	194150	194150	640	325	10.62	0.17	0.3	50.78	100%	13	5	Nil

13.2 EPIDEMIOLOGICAL DATA FOR THE YEAR 1985 to 1991 Dist:- Im
State:- M

Year	Population (lacs)	B.S. collected	B.S. Examined	Total +ve.	Pf	ABER	SFR	API	Pf%	% of R.T. given	No.of cases in age group		Rem
											0-1	1-4	
1	2	3	4	5	6	7	8	9	10	11	12	13	
1985	6.17	52271	52271	512	297	8.47	0.56	0.82	58.0	99.8	8	7	
1986	6.34	61534	61534	410	206	9.70	0.33	0.64	50.2	99.7	5	0	
1987	6.39	59346	59346	334	148	9.28	0.2	0.5	44.3	100%	2	3	
1988	6.41	59188	59188	244	122	9.23	0.2	0.3	50.0	100%	2	1	
1989	6.53	61970	61970	248	100	9.49	0.1	0.3	40.3	99.5	0	2	
1990	6.65	57857	57857	164	104	8.70	0.1	0.2	63.4	100%	0	0	
1991	7.07	61574	61574	164	119	8.70	0.2	0.2	72.5	100%	0	0	

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13.3 EPIDEMIOLOGICAL DATA FOR THE YEAR 1985 to 1991

District :- Thoubal
State :- Manipur

Year	Population (Lacs)	B.S. Collected	B.S Examined	Total +ve	Pf	ABER	SER	API	Pf%	%of R.T. given	No. of cases in age group 0-1	No. of cases in age group 1-4	Remarks/Death
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1985	2.57	17971	17971	115	58	6.99	0.32	0.44	50.4	100%	0	0	Nil
1986	2.64	22943	22943	194	45	8.69	0.19	0.73	23.1	100%	0	0	Nil
1987	2.62	19062	19062	126	15	7.27	0.07	0.4	11.9	100%	0	0	Nil
1988	2.66	28975	28975	217	38	10.89	0.1	0.8	17.5	100%	0	0	Nil
1989	2.71	24656	24656	109	35	9.09	0.1	0.4	32.1	100%	0	0	Nill
1990	2.76	31346	31346	67	11	11.35	0.03	0.2	16.4	100%	0	0	Nil
1991.	2.90	28312	28312	49	10	9.74	0.04	0.16	20.4	100%	0	0	Nil

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13.4 EPIDEMIOLOGICAL DATA FOR THE YEAR 1985 to 1991

District:
State :

Year	Population (lacs)	B.S Collected	B.S. examined	Total +ve	Pf	ABER	SER	API	Pf%	% of R.T. given	No. of case in age grou	
											0 - 1	1 -
1	2	3	4	5	6	7	8	9	10	11	12	1 - 1
1985	1.56	11962	11962	9	1	7.65	.008	.05	11.1	100%	0	1
1986	1.61	10225	10225	30	21	6.35	0.20	0.18	80.0	100%	1	0
1987	1.60	11272	11272	8	6	7.04	0.5	0.04	75.0	100%	0	0
1988	1.64	12367	12367	22	20	7.54	0.1	0.1	90.9	100%	0	0
1989	1.67	15097	15097	48	28	9.04	0.1	0.2	58.3	100%	0	0
1990	1.70	14045	14045	34	6	8.26	0.04	0.2	17.6	97%	0	0
1991	1.80	14610	14610	56	18	8.12	0.12	0.3	32.1	100%	0	

13.5 EPIDEMIOLOGICAL DATA FOR THE YEAR 1985 to 1991

District:- Ukhrul
State :- Manipur

Year	Population (Lacs)	B.S. Collected	B.S. Examined	Total +ve	Pf	ABER	SER	API	Pf%	% of R.T. given	No. of cases in age group 0 - 1	1 - 4	Remarks/ Deaths
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1985	0.92	15436	15436	41	21	16.77	0.1	0.4	51.2	100%	0	1	Nil
1986	0.95	16384	16384	109	80	17.24	0.4	1.1	73.3	100%	0	1	Nil
1987	0.99	14686	14686	81	32	14.83	0.03	0.8	39.5	100%	1	0	Nil
1988	0.77	13705	13705	106	41	17.79	0.2	1.0	38.6	100%	1	3	Nil
1989	0.99	13232	13232	68	21	13.36	0.12	0.6	30.8	100%	0	0	Nil
1990	1.01	11678	11678	44	23	11.6	0.1	0.6	52.2	100%	0	0	Nil
1991	1.10	11237	11237	15	12	10.27	0.1	0.1	80.0	100%	0	0	Nil

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13.6 EPIDEMIOLOGICAL DATA FOR THE YEARS 1985 TO 1991

District :- C.C.pur
State :- Imphal

Year	Population (lacs)	B.S. Collected	B.S. Examined	Total +ve	Pf	ABER	SER	API	Pf%	% of R.T. given	No.of cases in age group 0 - 1	No.of cases in age group 1 - 4	Remarks/ Deaths
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1985	1.49	22077	22077	259	209	14.81	0.9	1.7	80.6	100%	4	3	Nil
1986	1.54	25505	25505	340	180	16.56	0.7	2.2	52.9	99.7	5	2	1
1987	1.53	24086	24086	230	66	15.74	0.2	1.5	28.6	100%	7	5	Nil
1988	1.60	24464	24464	179	104	15.29	0.4	1.1	58.1	99.4	12	4	1
1989	1.64	25498	25498	184	105	15.54	0.4	1.1	57.0	99.4	2	1	1
1990	1.67	26209	26209	129	98	15.59	0.3	0.7	75.9	100%	0	0	Nil
1991	1.76	27054	27054	242	138	15.36	0.5	1.3	57.0	100%	11	0	Nil

13.7 EPIDEMIOLOGICAL DATA FOR THE YEAR 1985 TO 1991

DIST: CHANDEL
STATE: MANIPUR

Year	Population (lacs)	B.S. collected.	B.S. examind.	Total +ve	Pf	AMER	SFR	API	Pf%	No. of R.T. given	No. of cases 0 - 1	No. of cases 1 - 4	Remark Deaths
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1985	0.62	11915	11915	160	72	19.21	0.6	2.5	45.0	100%	5	0	Nil
1986	0.64	11838	11838	187	127	18.49	1.0	2.9	67.9	99.4	1	3	1
1987	0.73	9899	9899	61	20	13.56	0.2	0.8	32.7	100	0	0	Nil
1988	0.71	11901	11901	107	29	16.76	0.2	1.5	27.1	100	1	0	Nil
1989	0.70	15442	15442	93	18	22.05	0.1	1.3	19.3	100%	2	0	Nil
1990	0.72	13337	13337	67	11	18.5	0.08	0.9	16.4	100%	1	1	Nil
1991	0.71	12944	12944	56	7	18.2	0.05	0.8	12.5	100%	0	0	Nil

13.8. Epidemiologic l.. for ... r 1985 to 1991

Dist:-Sangrur
State:-Punjab

Year	Population (lacs)	No. of cases collected	No. of deaths occurred	Total No. of cases tre-	No. of deaths	Death rate	Case fatality rate	Attack rate	Proportion of cases in children			Proportion of deaths in children		
										0-1	1-4		0-1	1-4
1985	1.72	18740	18740	14	1	10.8	0.005	.08	7.1	100	0	0		
1986	1.71	24857	24857	342	207	14.52	0.8	2.3	60.5	99.7	0	9		
1987	2.02	21010	21010	174	56	10.70	0.1	0.8	34.1	100	2	2		
1988	1.91	25501	25501	105	40	13.35	0.1	0.5	45.7	100	3	0		
1989	1.96	28870	28870	119	41	14.72	0.2	0.5	53.0	100	2	0		
1990	2.01	28650	28650	32	8	14.2	0.02	0.1	25.0	100	0	1		
1991	2.07	27224	27224	15	8	13.15	0.06	0.07	53.3	100	0	0		

13.8. Epidemiolo ic l D-ta
For the year 1985 to 1991

Dist:- Tamenglong
State-Manipur.

Year	Population (Lacs)	BS collected	BS Examind the	Total	PF	ABER	SFR	API	pf%	%of R.T.	No.of cases in the group 0-1	1-4
1985	0.69	13246	13246	56	31	10.19	0.2	0.8	55.3	100%	0	0
1986	0.71	14799	14799	155	33	20.8	0.2	2.3	19.8	100%	0	4
1987	0.80	11953	11953	80	6	14.9	0.05	1.0	7.5	100%	0	0
1988	0.74	10688	10688	96	37	14.4	0.3	1.2	38.5	98.9	2	0
1989	0.76	10879	10879	92	29	14.3	0.2	1.2	31.5	100%	2	0
1990	0.77	11446	11446	64	14	14.8	0.1	0.8	21.8	100%	0	0
1991	0.85	11195	11195	43	13	13.08	0.1	0.5	30.2	100%	0	0

13.1 Epidemiologic-l d-t-(1985 to 1991)
Dist:- Tamenglong.

14. STATE SPRAYING DATA

Year	Round	Total Pop. IN LACS	Pop. of Areas 2 API & above in lac	Pop. projected for spray in lac	Pop. covered in lacs.	Period of spray From	To	Achievements Targetted Room	Targetted CS	Sprayed Room	Sprayed CS	% coverage Rooms	% coverage CS	Insecticide consumed M.T
1985	I			226.2	-	1/4/85	15.6.85	134733	35631	122071	34536	90.9	96.9	NA
	II			226.2	-	1/7/85	30.8.85	134733	35631	120286	32424	89.2	90.9	NA
1986	I		212.9	276.7	276.7	1/2/86	17.3.86	165328	40401	139912	37429	84.6	92.6	NA
	II		215.9	281.2	281.2	1/8/86	15.9.86	167494	35874	149031	34608	88.9	96.4	NA
	S.R			344.1	344.1	7/2/87	13/3/87	205229	49611	182974	48058	89.1	96.8	31.1 MT
1987	I			363.2	334.1	16/5/87	29/6/87	219627	48966	194969	47401	88.7	96.8	36.86 MT
	II			377.0	328.0	18.8.87	3/10/87	189418	46109	168500	45436	89.0	98.5	35.03 MT
	SR		202.2	202.2	202.2	11.2.88	11.3.88	104949	24680	96073	24204	92.1	98.07	35.72 MT
1988	I	314.3	314.3	269.5		16.5.88	29.6.88	165208	47451	151807	46718	91.8	98.4	33.83 MT
	II	308.5	308.5	284.6		16.8.88	29.9.88	166732	40459	149699	39867	89.7	98.5	34.63 MT
1989	I			407.1	322.2	17.4.89	30.6.89	202526	44380	176738	43974	87.3	78.1	42.49 MT
	II			407.8	364.7	17.7.89	29.9.89	202526	45415	185229	44551	91.4	98.0	44.73 MT
1990	I			349.9	342.3	2/4/90	31.5.90	182931	38243	162587	37295	88.8	98.4	42.73 MT
	II			349.9	328.2	16.7.90	13.9.90	182931	38243	167440	37323	91.5	97.5	41.55 MT
1991	I			294.0	270.6	2.5.91	30.6.91	140402	32475	125403	31713	89.3	97.6	36.65 MT
	II			298.6	269.3	2.8.91	30.9.91	144306	33842	125830	33286	87.1	98.3	38.34 MT

Note: S.R. selection round. NA : NOT AVAILABLE

15. Logistics data

icles	No.required as per norms (M.P.O.)	No. available	On Road	No.required as replacement
eps	8	12	8	4(four)
ck-ups	8	9	5	5(five)
tor cycles	13	13	12	1(one)

Give separately for State HQ., Zonal level, District level, Zonal entomologist

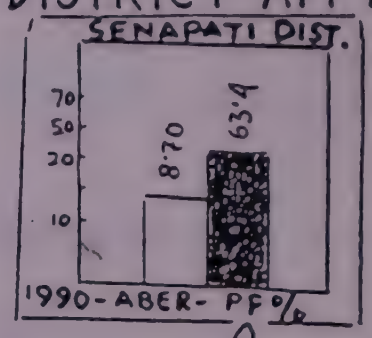
icroscopes	No. required	No. available	No. Out or order	New required
or States & istrict-wise	68	24	5	49

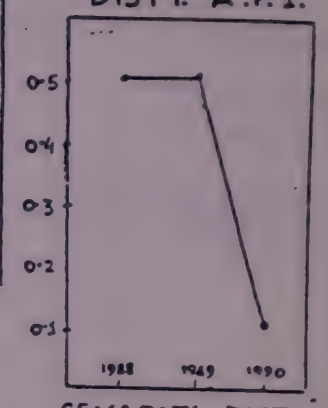
icroglass slides tate level	Annual requirement	Procured
1989	195644	
1990	194568	
1991	194150	

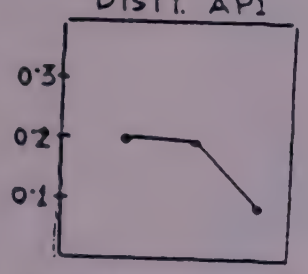
Spray pumps	Required	Available	Procured
1989	64	200	Nil
1990	79	200	
1991	46	200	

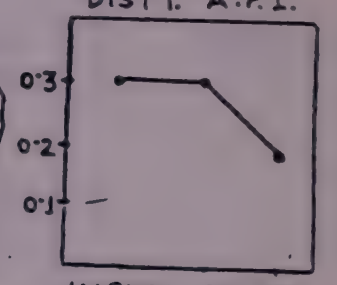
Anti Malarials	Required	Supplied by Govt.of India	Consumed
4 AQ			
1989	763200	3,000,000 tacs	
1990	730450	-	
1991	822021	3,000,000 tacs	

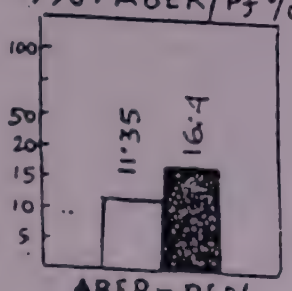
MAP OF MANIPUR SHOWING DISTRICT API BELOW ONE AND ABER/PF% (1990)

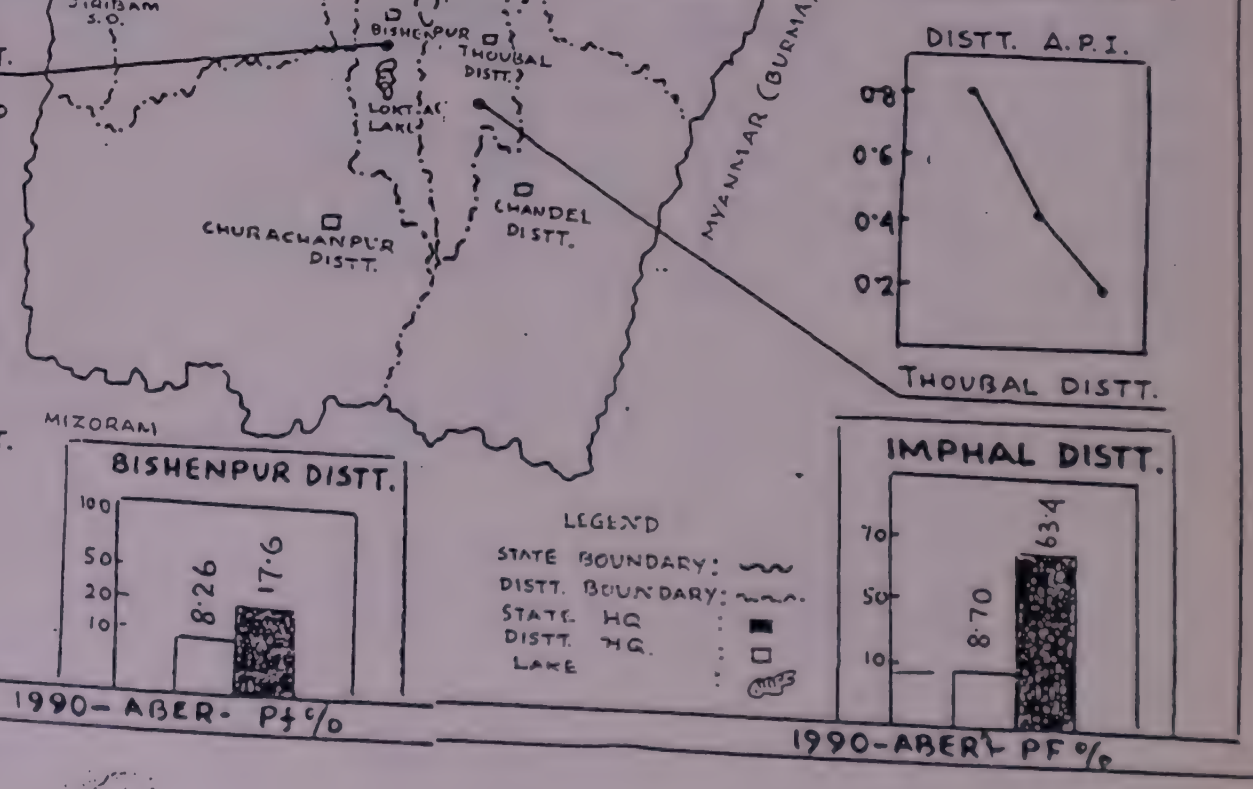




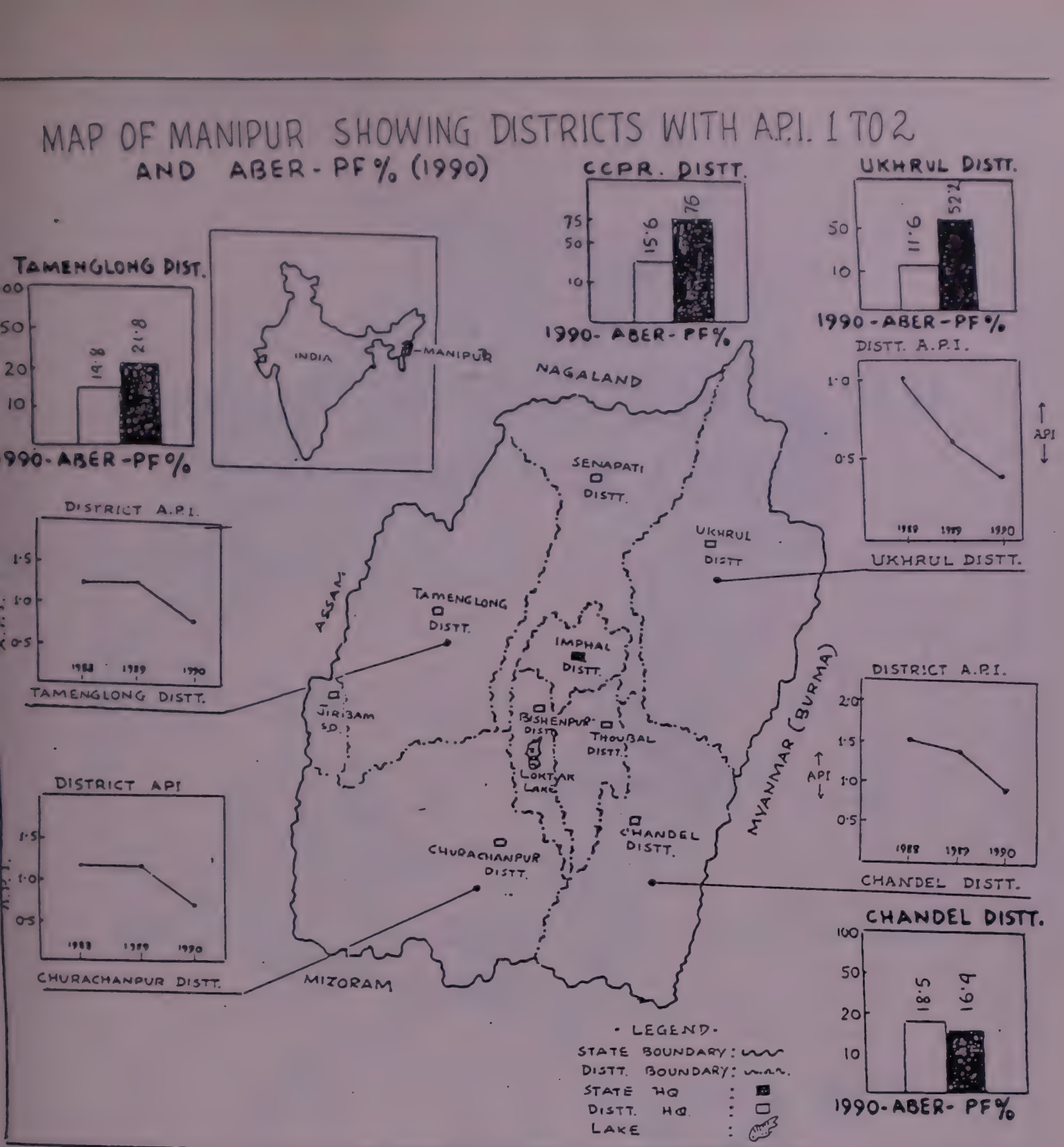




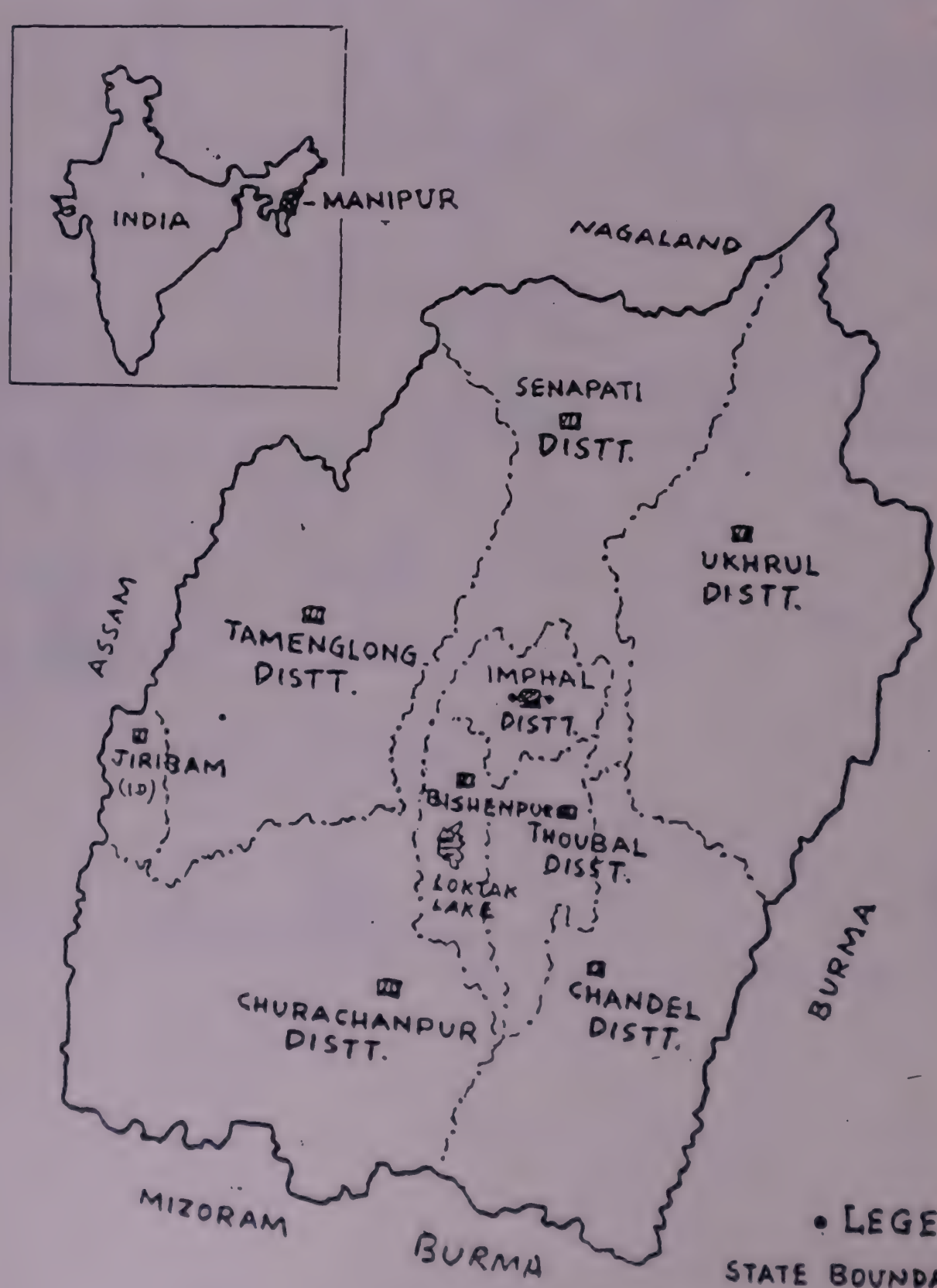




MAP OF MANIPUR SHOWING DISTRICTS WITH A.P.I. 1 TO 2 AND ABER - PF% (1990)



MAP OF MANIPUR STATE SHOWING DISTRICTS & THEIR HQ.



MAP OF MANIPUR
PHYSIOGRAPHY
[NOT TO SCALE]

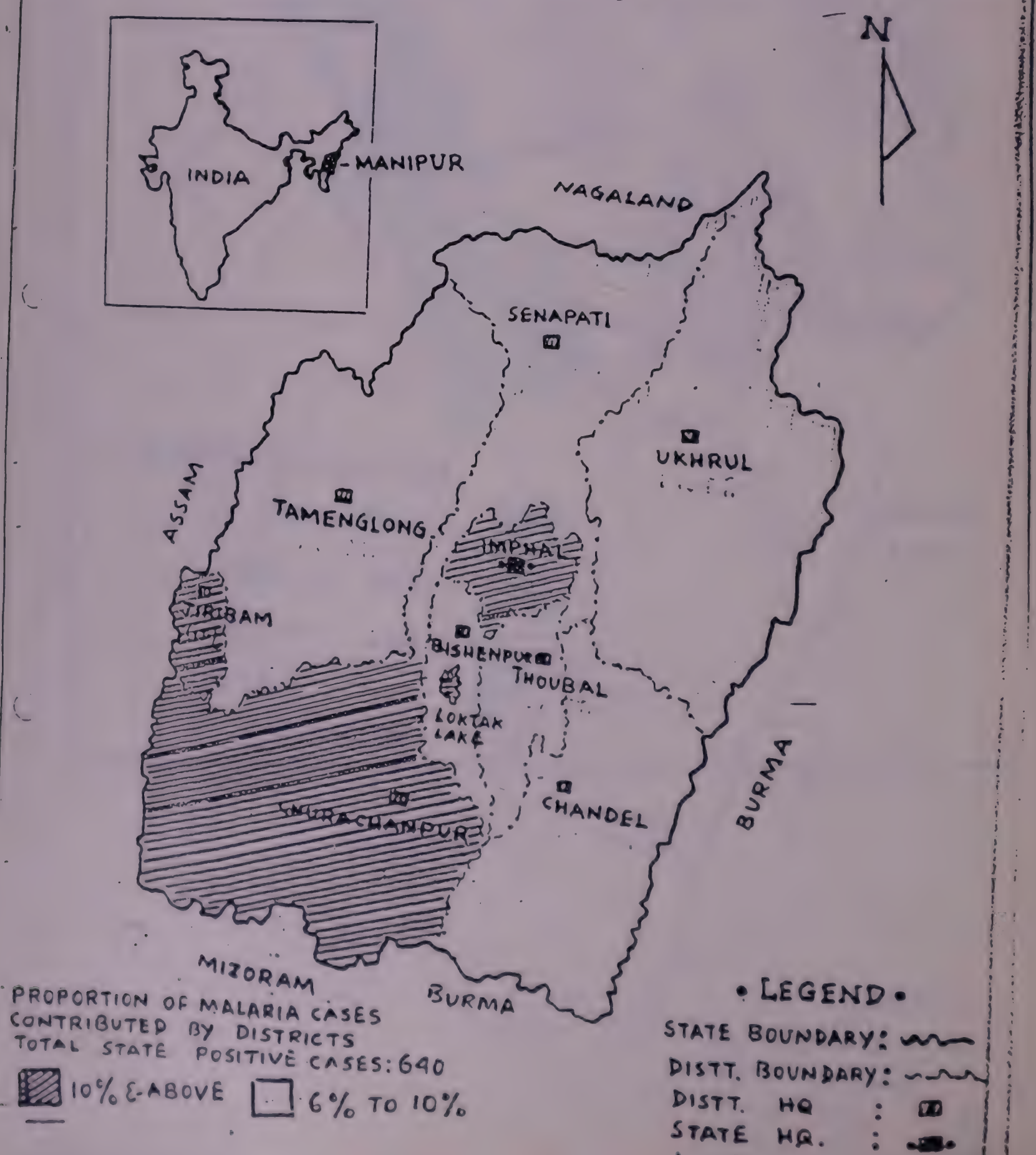
RIVERS:
LAKE :

ALTITUDE IN METRES

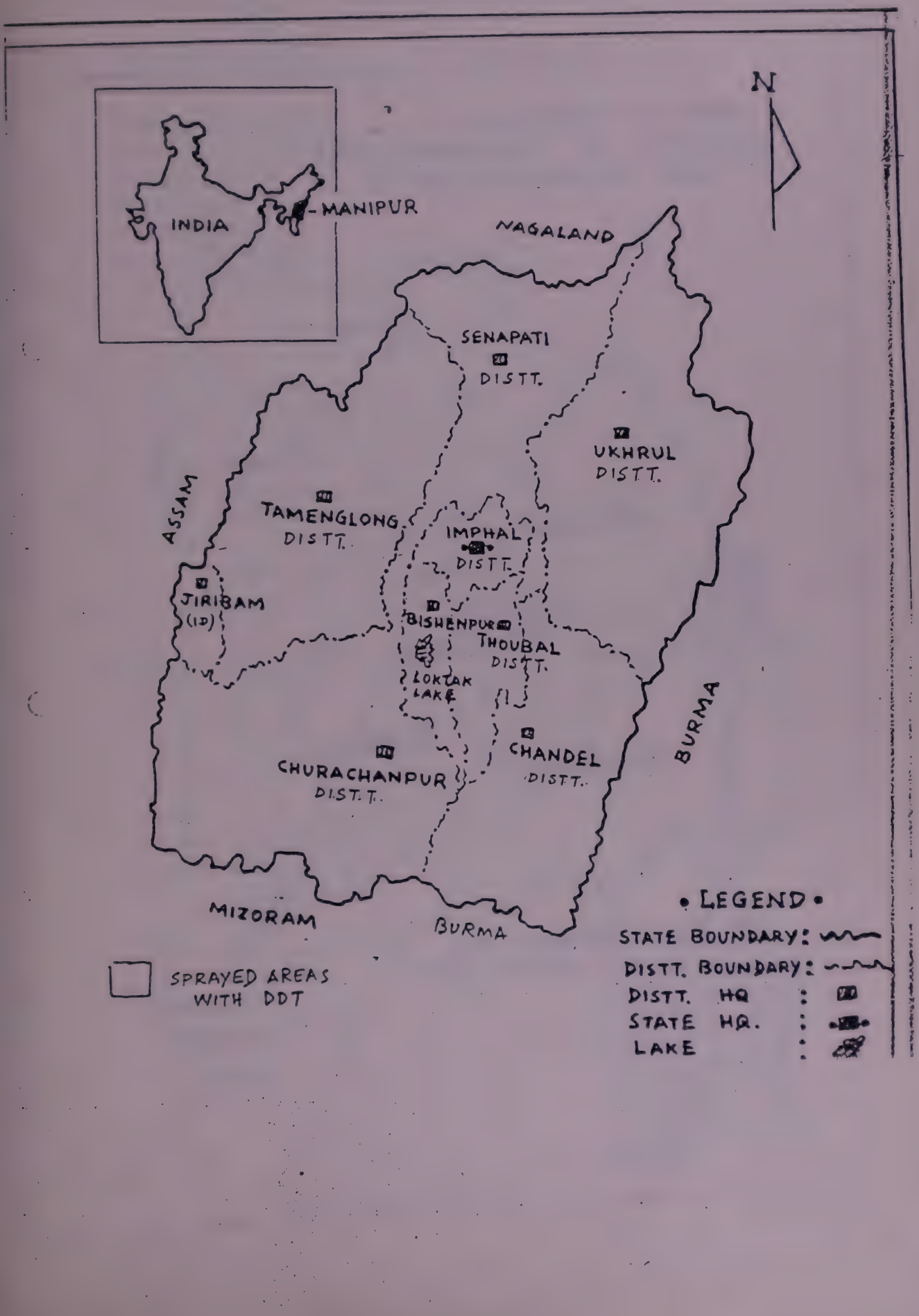
- ABOVE 1800
- 1200 TO 1800
- 600 TO 1200
- 300 TO 600
- BELOW 300

MAP OF MANIPUR SHOWING HIGH MALARIA INCIDENCE DISTRICTS

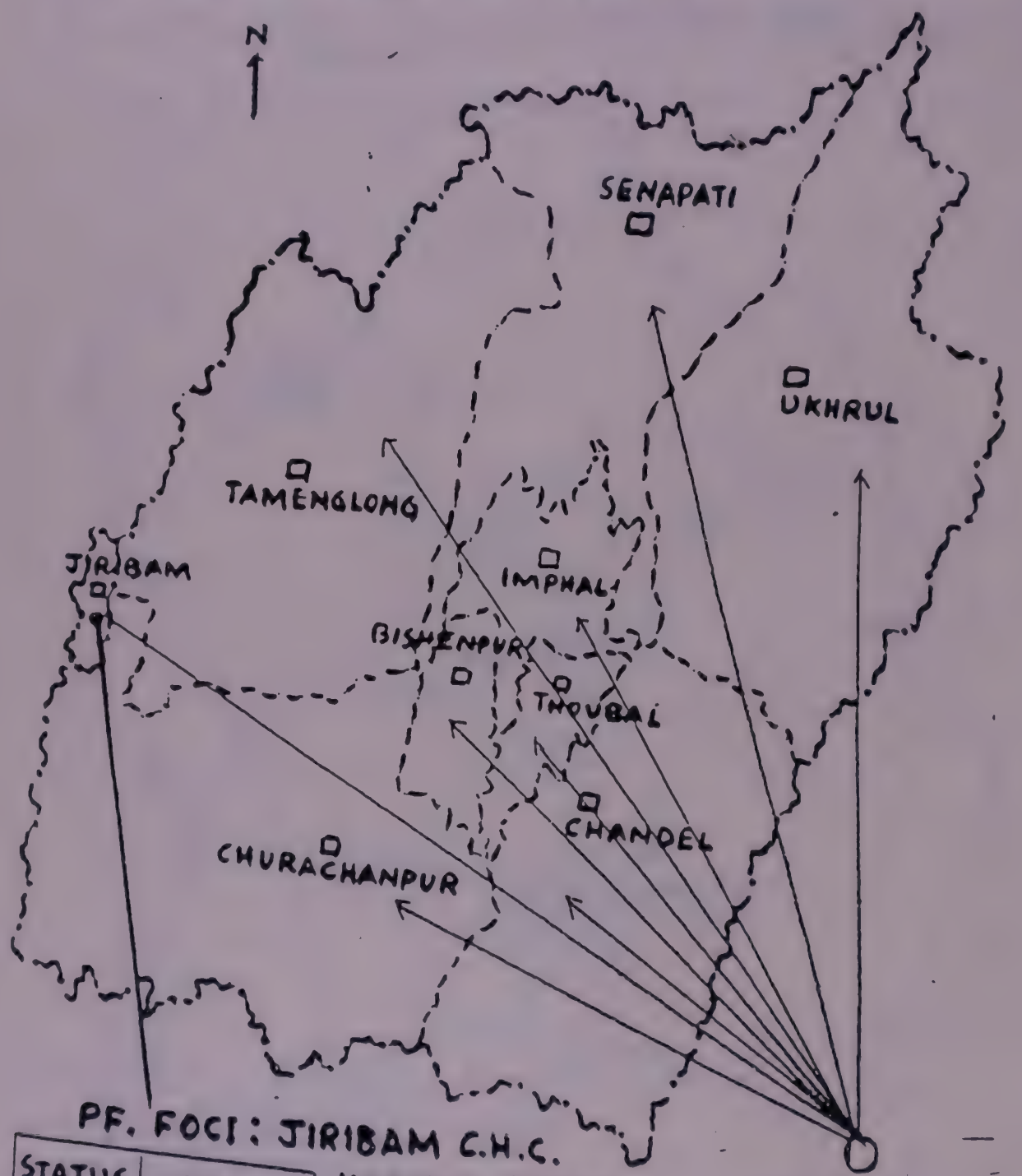
[BASED ON % OF CASE CONTRIBUTED BY DISTs.]



MAP OF MANIPUR SHOWING AREAS SPRAYED WITH DDT (1991)



MAP OF MANIPUR
SHOWING PF RESISTANCE FOCI AND VECTOR INFLUENCE



PF. FOCI : JIRIBAM C.H.C.
IMPHAL DISTT.

STATUS	1981
R I	16·7 %
R II	8·3 %
R III	NIL
R	ND
S	75·0 %

VECTOR INFLUENCE

1. An. minimus.
2. An. dirus.

Annexure-4

S T A T E N.M.E.P.

ORGANISATION DATA:

NAME OF STATE: MIZORAM

STATE DATA

1. Population of 1991 census	-	6,86,217
2. Number of Division/Zones	-	NIL
3. Number of Districts	-	4(four)
4. Number of NMEP Units	-	4(four)
5. Number of Blocks	-	20
6. Number of PHCs/SHCs/MC	-	35+22+17=74
7. Number of Villages.	-	736

TRIBAL DATA

(Based on Tribal Sub-Plan, Government of India)

1. Population of Tribal Area=	6,86,217
2. Number of Tribal Districts=	4(four)
3. Number of Tribal Blocks=	20
4. Number of Tribal PHCs/SHCs/MC=	20+22+17= 74
5. Number of Tribal Units=	Entire State.
6. Number of Tribal Villages=	736

Staff Position under State NMEP (as on 1.9.1992

Sl No.	Category	No.of Sanctioned.	In position	Vacant
1.	State Programme Officer(Malaria)	1	1	Nil
2.	State Entomologist	1	1	Nil
3.	Zonal/Divisional Medical Officer(Malaria)	Nil	Nil	Nil
4.	Biologist	Nil	Nil	Nil
5.	Dist.Malaria Officer	2	2	(1)
6.	Asst.Malaria Officer	3	2	1
7.	Zonal Entomologist	Nil	Nil	Nil
8.	Malaria Inspector	9	9	Nil
9.	Laboratory Technician (Micros)	40	40	Nil
10.	Insect Collector	Nil	Nil	Mil
11.	Multipurpose Worker(Male)	371	312	59

STAFF POSITION UNDER TRIBAL AREAS (as on 1.9.1992)

Sl.No	Category	No. sanctioned	In position	Vacant
1.	Zonal/Divisional Medical Officer (Malaria)	Nil	Nil	Nil
2.	Dist.Malaria Officer	2	2	Nil
3.	Asst.Malaria Officer	3	2	1
4.	Zonal Entomologist	Nil	Nil	Nil
5.	Malaria Inspector	9	9	Nil
6.	Laboratory Technician (Microscopist)	40	40	Nil
7.	Insect Collector	Nil	Nil	Nil
8.	Multipurpose Worker(male)	371	312	59

TRANSPORT POSITION

Transport Position in State(as on 1.9.1992)

Type	No.required under MPO	Road-worthy	Off road	New required.
Jeep	5	3	4	2
Jeep pick-up	4	Nil	Nil	4
Truck	8	Nil	Nil	8
Motor Cycle	9	Nil	Nil	9
Any other.Station Wagon.	1	Nil	Nil	1

Transport position inTribal Areas(as on 1.9.1992)

Type	No.required under MPO	Road worthy	Off road	New required
Jeep	5	3	4	2
Jeeps pick-up	4	Nil	Nil	4
Truck	8	Nil	Nil	8
Motor cycle	9	Nil	Nil	9
Any other Station wagon	1	Nil	Nil	1

Epidemiological situation in the State

	1987	1988	1989	1990	1991
Number of Malaria Cases	15339	20339	18517	13825	12486
ABER	34.38	35.63	38.40	29.60	28.48
API	27.59	35.50	30.70	24.10	19.04
SFR	4.14	4.36	3.90	3.30	3.10
P.f%	51.66	43.70	49.70	40.70	46.39

Epidemiological situation in Tribal areas

	1987	1988	1989	1990	1991
Number of Malaria cases.	15339	20339	10617	13825	12486
ABER	34.35	35.73	38.44	28.45	28.48
API	27.56	35.36	30.67	22.39	19.04
SFR	4.08	4.39	3.96	3.48	3.10
p.f.%	50.96	44.37	49.72	40.37	46.39
Deaths	28	16	17	8	12

SPRAY DATA (as per the State NMEP Policy)

DDT Spray Data(State)

1. No. of Districts under DDT spray	= 4
2. No of PHCs under DDT spray(SHC/MC)	= 74
3. No.of sections under DDT spray	= 310
4. Total population under DDT spray	= 6,86,217

DDT Spray Data(Tribal areas)

1. No.of Districts under DDT spray	= 4
2. No.of PHCs under DDT spray.(SHC/MC)	= 74
3. No.of Sections under DDT spray	= 310
4. Total population(tribal) under DDT spray	= 6,86,217

BHC Spray Data(State).

1. No.of Districts under BHC SPRAY	= Nil
2. No.of PHCs under BHC spray	= Nil
3. No.of sections under BHC spray	= Nil
4. Total population under BHC spray	= Nil

BHC Spray Data(Tribal areas)

1. No.of Districts under BHC spray	= Nil
2. No.of PHCs under BHC spray	= Nil
3. No.of sections under BHC spray	= Nil
4. Total population (tribal) under BHC spray	= Nil

MALARIA OUTBREAKS

Focal outbreaks of Malaria in State (1987-1991)

Year	No.of outbreaks in State/ Tribal areas	No.of confirmed cases in State/ Tribal areas
1987	Nil	Nil
1988	Nil	Nil
1989	Nil	Nil
1990	Nil	Nil
1991	Nil	Nil

ANNEXE-1

INFORMATION FROM STATES REQUIRED FOR TASK FORCE

1. Maps of the state showing
- Geographical features)
- Zones and Districts with their H.G.
- High incidence Districts marked with colour)
  1990 API ,ABER,PF% in each District
- Pf.Resistance foci) Enclosed
- Areas under insecticide spraying Malathion.
  BHC,DDT marked by colour)
- Vectors if more than one.

2. Total area of the State in Sq.Km.21087
   percentage of State's total area.
- Hill area Sq.Km-21087 Sq.Km.
- Forested area Sq.Km-18592 Sq.Km.
- Cultivated area in hectars-76.500 in thousand hectars.
- Rice cultivated area in hectars-58.00 in thousand hectars.
- Irrigated area in hectars -28.80 in thousand hectars.

3. Meteorologica Data for last 5 years.
   (month-wise statement can be furnished)
- Average rainfall,highest and lowest-208 cm to 350 cm per annum.
- Main rainy season(months)-May to September.
- Mean temperature,maximum temperature and
  Minimum temperature-Winter- 10°C to 21°C
  Summer-20°C to 29°C

4. Altitude r ange in the State-100 m to 2210 m
- No.of major/minor medium and lakes

1). Palak lake	1 Vahai PHC	Chhimtuipui Dist.
2). Rungdil lake	1 Suangpuilawn PHC	Aizawl District.
3). Tamdil lake	1 Saitual PHC	Aizawl District,

5. Demographic Data

Total Population (as per 1991 census)-		6,86,217
Rural		6,86,217
Urban	-	Nil
Tribal	-	6,86,217
Sex ratio	State as a whole	924 females per 1000 males
	in Rural area	924 females per 1000 males
	inTribal area	924 females per 1000 males
Density of population		
	In whole State	33 per Sq.Km.
	in Rural area	33 per Sq.Km.
	in Tribal area	33 per Sq.Km.

Literacy rate	Rural	Urban	Tribal
Male	84.06	-	84.06
Female	78.09	-	78.09

6. Brief history of Malaria Programme in State highlighting current situation of Malaria in the State.

War against Malaria was started in Mizoram for the first time in 24th October,1957 under the NMCP. The control Programme was however converted to Eradication Programme in April,1958. Two rounds of spray with DDT were carried out since then till 1978. From 1979 DDT insecticide was changed to BHC at the advised of Dr.D.D.Arora,the then Director of Health Services, Mizoram. Three rounds of spray with BHC was continue -d for ten years and the insecticide was again changed f rom BHC to to DDT as per Govt.of India instruction. Two rounds of spray was done with DDT during 1990 but no insecticidal spray was done during 1991 due to non availability of insecticides(DDT). For current year i.e. 1992 two rounds of spray with DDT was carried out as follows:-

1st round- From 11.5.1992 to 30.6.1992

2nd.round- From 3.8.1992 to 21.9.1992

During 1st round of DDT spray 1992 the room coverage percentage being 80.71

63

The entire Mizoram State is under MPW Scheme with fortnightly surveillance by Health Worker(male). The ABER of Mizoram ranging from 28-38 appears to be one of the highest in the country. Comparative epidemiological situation for the last 5 years indicates highest malaria incidence in the state during 1992. The reasons of high malaria incidence in Mizoram seems to be non-spray of insecticide during 1991.

7. Organisational Data

_please give organogramme for State, District, PHC.

	Whole State	Tribal
No.of Divisions__	-	-
No.of Revenue Districts	3	3
No.of Malaria Districts or Units	4	4
No.of Blocks	20	20
No.of Towns and Cities	2	2
No.of Villages	736	736

8. Health institutions

	State	Tribal area
1. No.of Hospitals	7	7
2. No.of Dispensaries Govt.	Nil	Nil
Locl Body	Nil	Nil

	State		Tribal	
	Required	Functioning	Required	Functioning
CHC	9	5	9	5
PHC	35	35	35	35
Sub-Centres	220	310	220	310
FTDS	-	756	-	756
DDCs	-	-	-	-

National norms for institutions and staff enclosed.

9.Staff Position as on 1.9.92.

Name of post.	No.required as per norms of Govt. of India.	No. sanctioned.	Vacant	In Malaria trained	Pay Scale	Remarks.
9.a) State Level.						
- State Programme Officer	1	1	Nil	Trained	Rs.3000-4500/-	
-State Entomologist	1	1	Nil	Trained	Rs.2000-3500/-	
-Other Offices and staff at Hq.such as Clerks,Accountant, Lab.Tech,Statistician etc.						
UDC	1	1	Nil		Rs.1400-2600/-	
Typist	1	1	Nil		Rs.1200- 2040/-	
Driver	1	1	Nil		Rs. 950-1500/-	
Peon	1	1	Nil		Rs. 850-1025/-	
9.b. Zonal level						
- Zonal Officer Malaria	-	-				
- Zonal Entomologist	-	-				
- Lab.Technician	2	Nil				
- Insect collector	2	Nil				
- Other staff	-	-				
9.c. District						
-CMO/DCMO(DCM&HO)	4	4	Nil	Trained	Rs3000-5000/-	
- Dy.CMO/DCMO(SDM&HO)	1-	10	Nil	Trained	Rs.3000-4500/-	
- DMO	4	2	Nil	Trained	Rs.2000-3500/-	
- Asst.Malaria Officer	4	3	Nil	Trained	Rs.1400-2600/-	
- Malaria Inspector	32	9	Nil	Trained	Rs.950-1500/-	
- Lab.Tech(Microcopist)	74	40	Nil	Trained	Rs.950-1500/-	
- Insect Collectors	-	-				
- Drivers	16	4	Nil		Rs.950-1500/-	

- Other staff

- SI/Health Suprv	32	23	Nil	Trained Rs.1600-2600/-
- SW/MPWs(Male)	125	90	Nil	TrainedRs.1350-2200/-
- FW	20	11	Nil	Trained Rs.950-1500/-
- Mechanic	3	1	Nil	Rs.950-1500/-
-Driver	12	4	Nil	Rs.950-1500/-
- Van cleaner	6	4	Nil	Rs.800-1025/-
- Accountant/UDC	6	4	Nil	Rs.1400-2600/-
- Store Keeper	3	1	Nil	Rs.1200-2040/-
- Peon	6	4	Nil	Rs. 800-1025/-
- Sweeper	3	1	Nil	Rs.800-1025/-
- F.W.(part time)	274.	274		Rs.32/- per day.

9.PHC staff Position as on 01.9.92.

9.d.

Name of post.	No.requi-	Sanctioned	Functioning	Remarks
1. Medical Officer		57	57	This includs
2. Lab.Lech Asst.		64	64	es 35 PHCs
3. L.H.V.		Nil	Nil	and 22 SHCs
4. A.N.M.		Nil	Nil	which also func tion as PHC
5. Health Supervisor(Male)		84	75	
Health Asst.				
6. MPW Male.		371	312	
9.e. Village health guides/CHG		53 5	535	
9.f. No.of ICDS Blocks		19	19	
No.of Aganwadi Workers.		1094	1094	

Norms of Government of Indian Given in enclosure.

10.Training:

Give Malaria training status of following staf:

Category	Total No	Trained	Where	Untrained
- Medical Officers	120	54	Aizawl. conducted W.H.O.,G.O.I.	66
-Multipurpose Supvisor Male	75	Trained,	Health Worker Training School Aizawl.	Nil
-Multipurpose Supervisor female	74	Trained	-do-	Nil
-MPW.Male	312	Trained	-do-	Nil
-MPW.Female	365	Trained	-do-	Nil
-Lab.Tech(Micros)	40	Trained	R.D.Shjillong & Aizawl State Hosp.R.D. Shillong.	Nil
--Malaria Inspectors	9	Trained	R.D.Shillong	Nil
-Entomologist	1	Trained	N.I.C.D.Delhi	Nil
-Malaria Officers	2	Trained	N.I.C.D.Delhi	Nil
-Asst.Malaria Officer	3	Trained	R.D.Shillong	Nil

11.Please list the training facilities available for training and retraining the various categories of post:

11.1. Male MPHW- Health Worker Training School,Aizawl.

11.2. Lab.Tech(Micros)- State Hospital,Aizawl.

11.3. MPHA-Male-health Worker Training School,Aizawl.

11.4. MPH Worker(Male) -do-

11.5. MPHA(Female) -do-

11.6. MPHW(Female) -do-

11.7. Malaria Inspector-Regional Director,Shillong.

11.8. Medical Officer- All India Institute of Hygiene & Public Health,Calcutta.

12. FINANCIAL DATA

Year	Required as per technical need	Central allocation	State allocation	Provision made in state budget	Amount actually made available by State during the year.	Date of release of funds	Actual expenditure out of State fund			
							Total	Purchase of insecticide	On employing spray teams	other contingency expenses.
1985-86		45.25	Nil	Nil	Nil	N.A.	Nil	Nil	Nil	Nil
1985-87		48.41	Nil	Nil	Nil	1st.10.7.86 2nd 4.12.86	Nil	Nil	Nil	Nil
1987-88		55.80	Nil	Nil	Nil	1st.29.6.87	Nil	Nil	Nil	Nil
1988-89		18.71	39.33	39.33	39.33	1st.14.6.88 2nd.22.9.88	39.33	Nil	13.15	2.66
1989-90		23.00	40.78	40.78	40.78	1st.19.6.89 4th.30.3.90	40.78	Nil	13.15	7.78
1990-91		13.93	48.17	48.17	48.17	1st.6.7.90 4th.27.3.91	48.17	Nil	8.57	6.81
1991-92.		2.81	56.00	56.00	56.00	1st.1.7.91 3rd.18.1.92	56.00	Nil	Nil	11.81

Give separately a note on the constraints you expedience in timely release of funds (during last 3 years(1990-92)

Note: Release of fund is always received late every quarter and sometime fund release order is received few days before the end of financial year that creats a lot of problem in planning and implementation of the programme. It is advised to the Govt.of India to release fund timely in future for the success of the programme.

State Government always released fund in time.

13. EPIDEMIOLOGICAL DATA(1985-1991)STATE: MIZORAM

Year	Population	B.C.Collection.	B.S.Examined.	-Total positive	PF.	ABER	SFR	API	PF%	% R.T. given	No.of cases age gr. 0-4	Death	Remarks
1985	521559	193102	193102	16217	8203	37.02	4.24	31.09	50. 58	100%	1124	5	
1986	544794	210219	210219	19111	10152	38.58	4.82	35.07	53.12	100%	1508	34	
1987	556473	191186	191186	15339	7818	34.35	4.08	27.56	50.96	100%	1247	28	
1988	575129	205520	205520	20339	9025	35.73	4.39	35.36	44.37	100%	1819	16	
1989	603618	232046	232046	18517	9208	38.44	3.96	30.67	49.72	100%	1804	17	
1990	617812	175816	175816	13825	6135	28.45	3.48	22.37	40.37	100%	1920	8	
1991	655737	186778	186778	12486	5739	28.48	3.10	19.04	46.39	100%	899	12	

13. SIMILAR DATA FOR DISTRICT-WISE(1985-1991) STATE-MIZORAM

Year	Sl No.	Name of District.	Population	BS Collection.	BS Examined	Total positive.	PF	ABER	S.F.R.	A.P.I.	PF %	R.T. %	Age Gr 0-4	Death	Remarks
1985	1.	AIZAWL	365691	139142	139142	9803	6002	38.04	4.31	26.80	61.22	100%	563	-	
	2.	LUNGLEI	84714	30685	30685	4576	1580	36.22	5.14	54.01	34.52	100%	372	-	
	3.	CHHIMTUIPUI	71154	23275	23275	1838	621	32.71	2.66	25.83	33.78	100%	191	5	
1986	1.	AIZAWL	388608	143395	143395	10759	7484	36.89	5.21	27.68	69.56	100%	613	20	
	2.	LUNGLEI	84025	41635	41685	6946	2211	49.61	5.30	82.66	31.83	100%	724	11	
	3.	CHHIMTUIPUI	72161	25135	25135	1406	457	34.83	1.81	19.48	32.50	100%	143	3	
1987	1.	AIZAWL	397622	126860	126860	8491	5679	31.90	4.47	21.35	66.88	100%	452	28	
	2,	LUNGLEI	87917	39484	39484	4928	1568	44.91	3.97	56.05	31.81	100%	613	-	
	3.	CHHIMTUIPUI	70934	24842	24842	1920	571	35.02	2.29	27.06	29.73	100%	285	-	
1988	1.	AIZAWL	395446	127448	127448	11511	5614	32.22	4.40	29.10	48.77	100%	625	14	
	2.	LUNGLEI	87872	44610	44610	5868	2455	50.76	4.39	66.77	41.83	100%	827	-	
	3.	CHHIMTUIPUI	69934	33462	33462	2960	956	47.84	2.85	42.32	32.29	100%	388	2	
1989	1.	AIZAWL	428359	148341	148341	10718	6713	34.62	7.22	25.01	62.63	100%	631	17	
	2.	LUNGLEI	91154	44587	44587	4802	1759	48.91	3.94	52.68	36.63	100%	426	-	
	3.	CHHIMTUIPUI	84105	39118	39118	2997	736	46.35	1.88	35.51	24.55	100%	347	-	
1990	1.	AIZAWL'.w'	241923	67693	67693	5484	3066	27.98	4.52	22.46	55.90	100%	328	7	
	2.	AIZAWL '.E'	192874	45103	45103	2671	1360	23.38	3.01	13.84	50.91	100%	380	-	
	3.	LUNGLEI	93968	32798	32798	3201	1180	34.90	3.59	34.06	36.86	100%	375	1	
	4.	CHHIMTUIPUI	89047	30217	30217	2469	529	33.93	1.75	27.72	21.41	100%	292	-	
1991	1.	AIZAWL'W'	260099	77604	77604	4613	2736	29.83	3.52	17.73	59.31	100%	308	11	
	2.	AIZAWL'E'	207069	52496	52496	2460	1286	25.35	2.44	11.88	52.27	100%	251	1	
	3.	LUNGLEI	96009	31922	31922	3214	1236	33.24	3.87	33.47	38.45	100%	348	-	
	4.	CHHIMTUIPUI	92560	24756	24756	2199	535	26/74	2.16	23.75	24.75	100%	501	-	

14. STATE SPRAYING DATA.

Year	Roun-ds.	Total popu-lation.	Pop of Area 2 API & above.	Pop.pro-jected for spray.	Pop cove-red.	PERIOD OF SPRAY FROM	TO	ACHIEVEMENTS TARGETTED ROOMS	TARGETTED C.S.	SPRAYED ROOMS	SPRAYED C.S.	% COVERAGE ROOMS	% COVERAGE C.S.	Insecticide Consumed M.T.	
985	1st.	503284	503284	503284	414257	1.4.85	20.5.85	158970	18969	111173	11790	69.9.	62.15	27.340	BHC
	2nd	521559	521559	521559	387018	10.6.85	29.7.85	156055	12893	136981	11453	87.7	88.8	26.883	-do-
	3rd	521559	521559	521559	370854	28.8.85	14.10.85	150254	13119	120245	12227	80.02	93.2	27.490	-do-
986	1st.	521559	521559	521559	391856	1.4.86	20.5.86	201852	15539	157673	13301	81.8.	64.1	35.188	-do-
	2nd	521559	521559	521559	423054	9.6.86	28.7.86	181508	14714	152576	14207	83.9	97.8	33.672	-do-
	3rd.	521559	521559	521559	448397	26.8.86	13.10.86	109623	15551	87596	15474	79.9	99.5	37.708	-do-
987	1st.	567625	567625	567625	355982	1.4.87	25.5.87	158251	14564	125960	13727	75.1	95.3	35.019	-do-
	2nd.	548363	548363	548363	431430	10.6.87	29.7.87	184981	15275	143941	14171	76.9	63.1	38.280	-do-
	3rd.	556473	556473	556473	408559	26.8.87	14.10.87	172336	11022	132739	8733	77.0	79.2	32.955	-do-
988	1st.	575129	575129	575129	376740	4.4.88	23.5.88	169182	12437	123321	11382	72.89	91.5	29.244	-do-
	2nd.	575129	575129	575129	394721	20.6.88	9.8.88	172348	11601	131496	10514	75.7	90.6	28.306	-do-
	3rd.	575129	575129	575129	427453	1.9.88	20.10.88	188528	13544	147734	11315	73.3	83.5	31.973	-do-
989	1st	592510	592510	592510	466603	3.4.89	22.5.89	201540	17983	146248	15207	72.5	84.5	33.770	-do-
	2nd.	603618	603618	603618	431862	12.6.89	31.7.89	217527	15015	164127	13161	76.1	88.6	32.392	-do-
	3rd.	570554	570554	570554	438290	1.9.89	208411	18670	144649		16159	71.5	84.14	33.577	-do-
990	1st.	596219	596219	596219	478607	16.7.90	3.9.90	224425	17437	172148	15167	76.7	86.9	41.834	-do-
	2nd.	604497	604497	604497	437714	17.9.90	5.11.90	215242	17652	153670	15457	71.3	87.5	32.229	-do-
991	1st.														
	nd.	There is no spray during 1991 as the DDT has not been supplied by the Govt. of India.													

14. STATE SPRAYING DATA DISTRICT-WISE

Year	Name of District	Round.	Total population.	Pop of area 2 API & above.	Pop.protected. for spray	Pop covered.	PERIOD OF SPRAY From	To	ACHIEVEMENT TARGETTED Rooms	TARGETTED CS	SPRAYED Rooms	SPRAYED CS	% COVERAGE Rooms	% COVERAGE CS	Insecticides consumed M.T.	
1.		1.	351602	351602	351602	288464	1.4.85	20.5.85	101461	17379	64152	10200	63.23	50.69	18.657	-d-
	AIZAWL	2.	365691	365691	365691	270458	10.6.85	29.7.85	98544	10666	87097	9226	83.3	86.4	16.726	-d-
9		3	365691	365691	365591	263537	26.8.85	14.10.85	98149	11495	79163	10603	80.	92.	17.249	-d-
		1.	85215	85215	85215	62041	1.4.85	20.5.85	33601	1372	26577	1372	73.	100	6.165	-d-
8	LUNGLEI	2.	84714	84714	84714	61849	10.6.85	29.7.85	33603	1426	26264	1426	78.	100	6.200	-d-
		3.	84714	84714	84714	52017	26.8.85	14.10.85	33505	1403	26082	1408	74.64	100	6.245	-d-
5		1.	65457	65457	65457	63754	1.4.85	20.5.85	23908	218	20444	218	85.5	100	2.480	-d-
		2.	71154	71154	71154	54771	10.6.85	29.7.85	23908	801	23620	801	93.77	100	3.957	-d-
	CHHIMTUIPUI	3.	71154	71154	71154	55300	26.8.85	14.10.85	18500	216	15000	216	81.3	100	4.000	-d-
		1.	355691	355591	355591	315219	1.4.86	20.5.86	152385	13600	121762	11212	79.7	82.4	24.678	-d-
		2	365691	365591	355591	324912	9.6.86	28.7.86	131043	12508	110075	12021	83.9	96.1	21.902	-d-
1.	AIZAWL	3.	365691	365691	355591	332707	26.8.86	13.10.86	44959	11206	41343	11129	91.9	99.3	24.651	-d-
		1.	84714	84714	84714	26258	1.4.86	20.5.86	30910	1051	21021	1051	84.9	100	6.010	-d-
9	LUNGLEI	2.	84714	84714	84714	50533	9.6.86	28.7.86	30934	1406	26258	1406	84.7	100	6.270	-d-
		3.	84714	84714	84714	61390	25.8.86	13.10.86	44677	3672	31453	3672	70.4	100	7.143	-d-
8		1	71154	71154	71154	30379	1.4.86	20.5.86	18357	1028	14890	1028	81.	100	5.500	-d-
		2	71154	71154	71154	47604	9.6.86	28.7.86	19481	800	16243	780	83.3	97.5	5.500	-d-
6	CHHIMTUIPUI	3.	71154	71154	71154	54500	25.8.86	13.10.86	19987	673	14900	673	74.0	100	5.914	-d-
		1	403224	403224	403224	301956	1.4.87	20.5.87	107937	11663	90590	11073	83.92	94.94	27.230	-do-
1	AIZAWL	2.	379231	379231	379231	320855	10.6.87	29.7.87	135754	12093	108436	11365	79.8	93.9	24.563	-do-
		3.	397622	397622	397622	304533	26.8.87	14.10.87	127947	6898	100707	5920	78.70	85.8	23.561	-do-
9		1.	89226	89226	89226	59526	1.4.87	20.5.87	31521	2806	21652	2559	68.6	91.1	6.889	-do-
		2	91893	91893	91893	50129	10.5.87	29.7.87	29901	2578	20385	2206	72.9	85.5	5.867	-do-
	LUNGLEI	3.	87917	87917	87917	58718	20.8.87	14.10.87	29978	3087	19911	2676	65.52	67.1	4.794	-do-
8		1.	75175	75175	75175	55000	1.4.87	20.5.87	18793	95	13718	95	73.0	100	6.900	-do-
		2.	77239	77239	77239	60496	10.6.87	29.7.87	19326	600	15117	600	78.0	100	6.900	-do-
7	CHHIMTUIPUI	3.	70934	70934	70934	45208	26.8.87	14.10.87	14411	137	12083	137	80.0	100	4.600	-do-

cont.2.

14.STATE SPRAYING DATA DISTRICT-WISE CONTD.

Year	Name of District	Rounds	Total population.	Pop.area 2API & above	Pop.projected for spray	pop.covered.	PERIOD OF SPRAY FROM	PERIOD OF SPRAY TO	ACHIEVEMENT TARGETTED ROOMS	TARGETTED CS	SPRAYED ROOMS	SPRAYED CS	% COVERAGE ROOMS	% COVERAGE CS	Insecticides Consumed M.T.	
		1st.	408012	408012	408012	283703	4.4.88	23.5.88	120532	8006	87304	7249	72.43	90.54	17.930	BHC
1	AIZAWL	2nd	408012	408012	408012	273625	20.6.88	9.3.88	117947	7978	93471	7242	79.2	90.7	19.770	-do
9		3rd.	408012	408012	408012	293553	1.9.88	20.10.88	133463	10530	107200	8619	80.3	81.8	20.752	-do
		1st	89160	89160	89160	53932	4.4.88	23.5.88	29184	2075	19006	1942	65.12	93.59	4.314	-do
8	LUNGLEI	2nd	89160	89160	89160	62813	20.6.88	9.8.88	32875	2403	20265	2072	61.6	85.5	4.535	-do
		3rd.	89160	89160	89160	66031	1.9.88	20.10.88	34557	2538	25433	2220	73.5	87.4	5.451	-do
		1st	77957	77957	77957	61105	4.4.88	23.5.88	19466	2356	17011	2191	87.0	92.0	7.000	-do
	CHHIMTUIPUI	2nd.	77957	77957	77957	58278	20.6.88.	9.8.88	21526	1200	16770	1200	77.9	100	4.000	-do
		3rd.	77957	77957	77957	62862	1.9.88	20.10.88	20508	476	15101	476	73.6	100	5.770	-do
		1st	418036	418036	418036	329795	3.4.89	22.5.89	150684	12312	107372	10691	71.2	86.8	24.680	-do
1	AIZAWL	2nd	428359	428359	428359	303642	12.6.89	31.7.89	159099	10146	118756	9317	75.1	91.8	23.312	-do
9		3rd	407451	407451	407451	304350	1.9.89	20.10.89	148295	12925	100317	11652	67.64	90.15	27.190	-do
		1st	91624	91624	91624	66599	3.4.89	22.5.89	28812	4229	20893	3234	72.5	76.4	5.100	-do
9	LUNGLEI	2nd	91154	91154	91154	60054	12.6.89	31.7.89	29080	4231	20743	327	71.3	78.2	4.670	-do
		3rd	84033	84033	84033	76514	1.9.89	20.10.89	32512	4958	24933	3832	75.85	77.28	5.937	-do
		1st	82850	82850	82850	70208	3.4.89	22.5.89	22044	1442	17978	1232	81.5	83.9	3.990	-do
9	CHHIMTUIPUI	2nd	84105	84105	84105	68166	12.6.89	31.7.89	30348	638	24923	617	82.12	96.70	4.4 0	-do
		3rd.	79070	79070	79070	57426	1.9.89.	20.10.89	27604	787	19343	675	70.	85.7	5.400	-do
		1st.	250103	250103	250103	200433	16.7.90	3.9.90	101957	7433	72245	6794	70.85	91.4	15.044	DDT.
1	AIZAWL'W	2nd	252163	252163	252163	182007	17.9.90	5.11.90	98245	7273	69457	6131	70.6	82.2	13,180	-do
		1st	170099	170099	170099	145845	16.7.90	3.9.90	63456	5204	55874	5058	83.05	97.4	12.740	-do
9	AIZAWL'E'	2nd	172678	172678	172678	137841	17.9.90	5.11.90	57207	5293	46504	5100	81.2	96.3	11.749	-do
		1st	91990	91990	91990	67943	16.7.90	3.9.90	32675	4315	23940	2854	73.26	66.3	5.400	-do
	LUNGLEI	2nd	95429	95429	95429	69066	17.9.90	5.11.90	36140	4587	25309	3776	70.03	82.3	3.500	-do
		1st	84027	84027	84027	62585	16.7.90	3.9.90	26337	485	20089	4512	75.2	92.9	3.650	-do
	CHHIMTUIPUI	2dd	84227	81227	81227	48800	17.9.90	5.11.90	23650	500	12400	450	52.4	90.0	3.800	-do
1991	N O T S P R A Y E D					N O T S P R A Y E D										

15. Logistics data

Vehicles	No. of required as per norms(MPO)	No. available	On Road	No. required as replacement.
Jeeps State	1	1	1	1
Dist.	4	2	2	2
Pick-ups State	Nil	Nil	Nil	Nil
Dist.	4	Nil	Nil	4
Motor Cycles State	Nil	Nil	Nil	Nil
Dist.	9	1	Nil	9

Give separately for State Hq. Zonal level, District level, Zonal entomologist. (No Zonal component in Mizoram).

Microscopies	No. required	No. available	No. out of order	New required.
For State & Dist. wise.	84	74	19	10
Aizawl 'W'	26	23		3
Aizawl 'E'	32	29		3
Lunglei	14	12		2
Chhimtuipui	12	10		2

Microglass Slides State level.	Annual requirement.	Procured.
1989	2,00,000	1,05,934
1990	2,00,000	1,44,000
1991	2,00,000	72,000

Spray Pumps	Required	Available	Procured.
1989	300	287	Nil
1990	300	274	Nil
1991	300	268	Nil

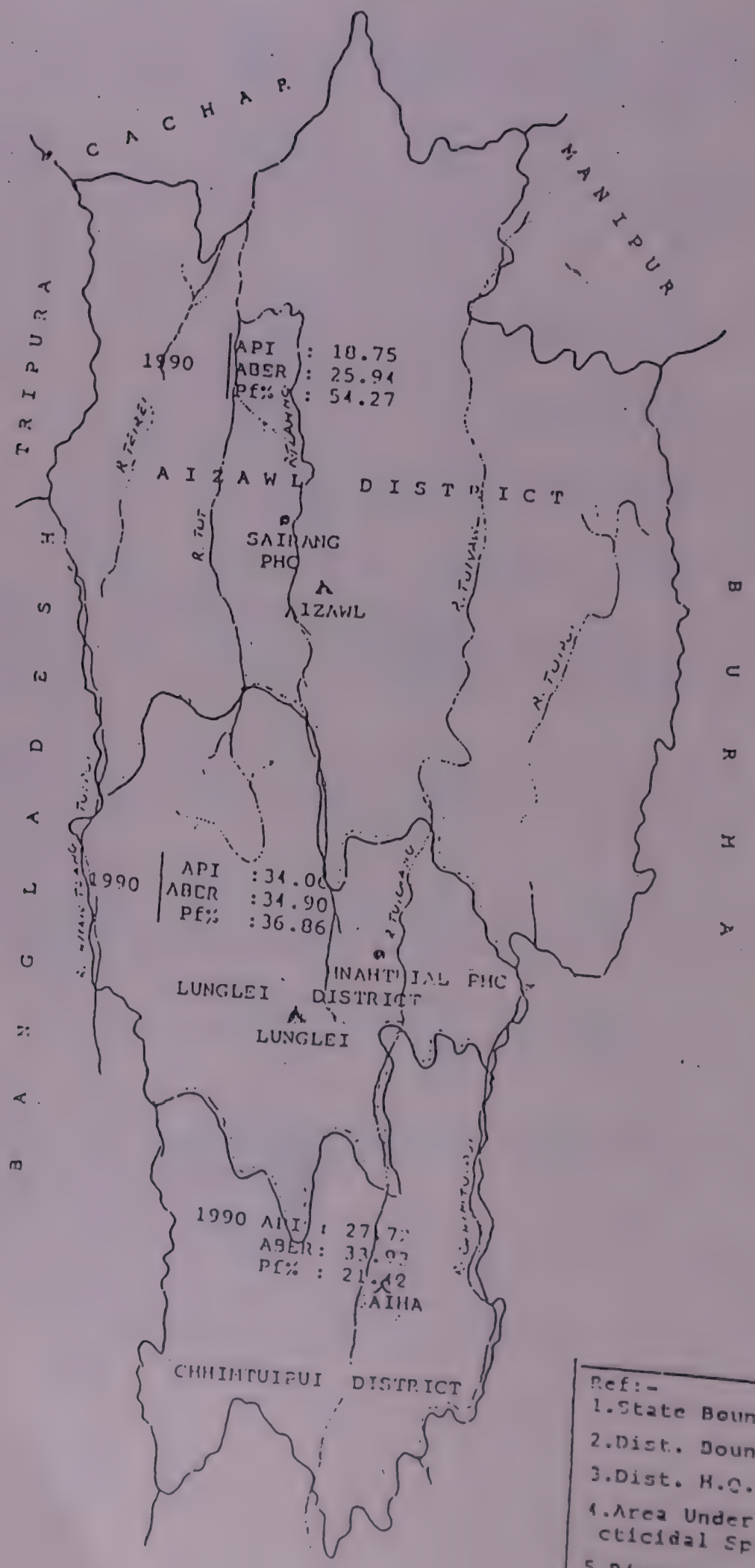
Antimalarials		Required	Supplied by Govt. of India	Consumed
4 AQ	1989	10,00,000	7,00,000	6,88,500
	1990	10,00,000	7,00,000	6,64,000
	1991	10,00,000	5,00,000	4,36,000
8 AQ				
2.5mg.	1989	1,00,000	2.5mg. Nil	2.5mg. Nil.
7.5mg.	-do-	3,00,000	7.5mg 6,00,000	7.5mg. 4,16,000
2.5mg.	1990	1,00,000	2.5mg 20,000	2.5mg 20,000
7.5mg	-do-	3,00,000	7.5mg 1,60,000	7.5mg 1,93,000
2.5mg	1991	1,00,000	2.5mg 80,000	2.5mg 71,000
7.5mg	-do-	3,00,000	7.5mg 2,40,000	7.5mg 2,36,000

Quinine Ampules Give availability and Distribution list for two years 1990, 1991.

Year	Quantity purchased	Consumed	Balance
1990	10,000	3,000	7,000
1991	-	7,000	Nil

Insecticides	Requirement	Procured	Supplied by Govt. of India	Consumed
1989	100 MT BHC	-	100 MT BHC	95.5 MT
1990	90 MT DDT	-	90 MT DDT	90.0 MT
1991	100 MT DDT		Not supplied	Nil.

MAP OF MIZORAM



Annexure-5

STATE N.M.E.P.

ORGANISATIONAL DATA

Name of State : Meghalaya

State Data

1.	Population of 1991 census	= 17,60,626 (provisional)
2.	Number of Divisions/Zones	= 10
3.	Number of Districts	= 7
4.	Number of NMEP Units	= 3 (Three) N.M.E.P Units
5.	Number of Blocks	= 30
6.	Number of PHCs	= 68
7.	Number of Villages	= 4,902

Tribal Data

(Based on Tribal Sub-plan, Government of India)

1.	Population of Tribal Area	=
2.	Number of Tribal Districts	=
3.	Number of Tribal Blocks	=
4.	Number of Tribal PHCs	=
5.	Number of Tribal Units	= Meghalaya is a Tribal State
6.	Number of Tribal Villages	=

80:.o tablets		Required	Supplied by Govt. of India	Consumed
1989	8.AQ Premaquine	- 2.5 Mg 50.000 - 7.5 Mg 100000	Nil 1,00,000 (5.983)	— 1,00,000
1990	8.AQ Premaquine	- 2.5 Mg 50.000 - 7.5 Mg 1,00,000	Nil 1,60,000 (28.9.90)	— 90.000
1991	8.AQ Premaquine	- 2.5 Mg 1,00,000 - 7.5 Mg 6,00,000	1,00,000 (16.3.91) 6,00,000 (11.3.91)	60,000 255,000

Quinine Ampules Give availability and Distribution list for two years 1990, 1991.

Insecticides	Requirement	Procured	Supplied by Govt. of India	Consumed
1989	290000 kgs	200 M.T	200 MT	49664.25 Kgs.
1990	67.50 MT	—	—	134022 Kgs.
1991	320000 kgs	270 MT	270 MT	229.74 Kgs.

SPRAY DATA
(as per the State NMEP policy)

DDT Spray Data (State)

1.	No. of Districts under DDT spray	7
2.	No. of PHCs under DDT spray	34
3.	No. of Sections under DDT spray	179
4.	Total population under DDT spray	883299

DDT Spray Data (Tribal areas)

1.	No. of Districts under DDT spray	
2.	No. of PHCs under DDT spray	Above
3.	No. of Sections under DDT spray	
4.	Total population (tribal) under DDT spray	

BHC Spray Data (State)

1.	No. of Districts under BHC spray	
2.	No. of PHCs under BHC spray	
3.	No. of Sections under BHC spray	
4.	Total population under BHC spray	

BHC Spray Data (Tribal areas)

1.	No. of Districts under BHC spray	
2.	No. of PHCs under BHC spray	
3.	No. of Sections under BHC spray	
4.	Total population (tribal) under BHC spray	

MALARIA OUTBREAKS

Focul outbreaks of Malaria in State (1987-1991)

Year	No. of Outbreaks in State/Tribal areas	No. of confirmed cases in State/Tribal areas
1987		
1988		
1989	NIL	
1990		
1991		

EPIDEMIOLOGICAL DATA

Epidemiological situation in the State

	1987	1988	1989	1990	1991
Number of Malaria cases	10975	11863	10701	8209	11155
ABER	12.65	12.4	11.8	8.5	11.8
API	6.6	7.3	6.4	4.7	6.6
SFR	4.04	4.3	3.9	3.8	3.5
P.f%	78.8	73.7	72.5	69.3	67.2
Deaths	1	—	—	—	—

Epidemiological situation in Tribal Areas

	1987	1988	1989	1990	1991
Number of Malaria cases					
ABER					
API					
SFR					
P.f%					
Deaths					

TRANSPORT POSITION

Transport position in State (as on 1.9.1992)

Type	No. required under MPO	Roadworthy	Off road	New required
Jeep	7	6	1	1
Jeep pick-up				
Truck (Miozi)	3	3		-
Motor cycle				
Any other	1	1	-	-

(Maruti Gypsy)

Transport position in Tribal Areas (as on 1.9.1992)

Type	No. required under MPO	Roadworthy	Off road	New required
Jeep				
Jeep pick-up		above		
Truck		(3)		
Motor cycle				
Any other				

Staff Position under State NMEP (as on 1.9.1992)

Sl. No.	Category	No. Sanctioned	In Position	Vacant (%)
1.	State Programme Officer (Malaria)	1	1	—
2.	State Entomologist	—	—	—
3.	Zonal/Divisional Medical Officer (Malaria)	1	1	1
4.	Biologist	—	—	—
5.	Distt. Malaria Officer	3	2	1
6.	Asst. Malaria Officer	3	3	—
7.	Zonal Entomologist	1	1	—
8.	Malaria Inspector	20	20	—
9.	Laboratory Technician	26	26	—
10.	Insect Collector	2	2	—
11.	Multipurpose Worker (male) (51) (S.C)	49 182	49 182	—

STAFF POSITION UNDER TRIBAL AREAS (AS ON 1.9.1992)

Sl. No.	Category	No. Sanctioned	In Position	Vacant (%)
1.	Zonal/Divisional Medical Officer (Malaria)			
2.	Distt. Malaria Officer			
3.	Asst. Malaria Officer			
4.	Zonal Entomologist		above	
5.	Malaria Inspector			
6.	Laboratory Technician			
7.	Insect Collector			
8.	Multipurpose Worker (male)			

DISTRICT WISE EPIDEMIOLOGICAL DATA - 1985 - 1991

Year	Name of District	Population	BSC	BSE	Positive	PF	ABER	API	SFR	PF %	% R.R given	No. of cases in age group 01 - 4	1 - 4	Death	Remark
1985	Khasi Hills	766026	53469	53469	1017	477	6.9	1.3	0.8	46.89	98.9	-	116		
	Jaintia Hills	202089	22968	22968	1692	33	11.3	8.3	0.1	1.9	99.8	-	197		
	Garo Hills	544800	132932	132932	9851	9172	24.4	18.08	6.8	93.1	93.1	312	2307		
	Total:-	1514915	209389	209389	12560	9682	13.8	8.2	4.6	77.08	97.5	312	2620		
1986	Khasi Hills	763035	64733	64733	1905	1333	8.2	2.4	2.05	69.9	98.3		230		
	Jaintia Hills	183527	29183	29183	1946	123	15.9	10.6	0.4	6.3	100		294	1	
	Garo Hills	563300	139221	139221	10836	10255	24.7	19.2	7.3	94.6	98.7	360	2693		
	Total:-	1529962	233137	233137	14687	11711	15.2	9.6	5.02	79.7	96.6	360	3217	1	
1987	Khasi Hills	806342	58218	58218	1901	942	7.2	2.3	1.6	49.5	98.8		301		
	Jaintia Hills	187631	23715	23715	1515	8	12.2	8.07	0.03	0.5	10.0		259		
	Garo Hills	587.8	116011	116011	7559	7047	19.7	12.8	6.07	93.2	96.5	204	1818	1	
	Total:-	1581773	197944	197944	10975	7997	12.5	6.9	4.04	72.8	97.4	204	2378	1	
1988	Khasi Hills	818668	56148	56148	2162	1151	6.8	2.6	2.04	69.8	81.2	-	296		
	Jaintia Hills	191606	20972	20972	1692	16	10.9	8.8	0.07	0.9	98.7	-	141		
	Garo Hills	594000	122677	122677	8009	7581	20.6	13.4	6.1	94.6	93.2	294	1665		
	Total:-	1604474	199797	199797	11863	8748	12.4	7.3	4.3	73.7	91.4	294	2220		
1989	Khasi Hills	834456	54939	54939	1848	1001	6.7	2.2	1.8	54.1	77.3	-	3025		
	Jaintia Hills	191806	22395	22395	1728	30	11.6	9	0.1	1.7	95.8	-	157		
	Garo Hills	627694	119211	119211	7121	6732	18.9	11.3	5.6	94.5	89.5	264	1523		
	Total:-	1653956	196595	196595	10667	7763	11.8	6.4	3.9	73.5	88.2	264	2003	Nil	
1990	Khasi Hills	863757	36846	36846	1036	361	4.2	1.1	0.9	34.8	52.2		156		
	Jaintia Hills	225367	20824	20824	1496	14	9.2	6.6	0.06	0.9	96.5		81		
	Garo Hills	641533	90086	90086	5675	5316	14.0	8.8	5.9	93.6	92.08	257	1299		
	Total:-	1730657	147756	147756	8209	5691	8.5	4.7	3.8	69.3	87.8	257	1536		
1991	Khasi Hills	877722	47895	47895	1631	838	5.5	1.8	1.7	51.3	65.5		257		
	Jaintia Hills	240193	31971	31971	2789	89	13.3	11.6	0.2	3.1	98.6		208		
	Garo Hills	660159	129006	129006	6735	6510	19.5	10.2	5.04	96.6	99.2	307	1599		
	Total:-	1678104	208872	208872	11155	7497	12.4	6.6	3.5	67.2	94.1	307	2064	Nil	

Information from States required for Task Force

1. Maps of the State showing — Highlighted (Enclosed)
   - Geographical features: Hilly topography with temperature
   - Zones and Districts with their H.Q.
   - High incidence Districts marked with colour
     1990 API, ABER, Pf% in each District
   - Pf. Resistance foci — already indicated in Status paper
   - Areas under insecticide spraying Malathion, BHC, DDT mark by colour
   - Vectors if more than one. — A. culicifacies

2. Total area of the State in Sq. Km. — 22,429 Sq/km.
   Percentage of State's total area
   - Hill area sq. km. — 22,429.
   - Forested area sq. km. — 449.60 hectares
   - Cultivated area in hectars — 1,96,000 hectares.
   - Rice cultivated area in hectars — 1,09,700
   - Irrigated area in hectars — 2195 hectares

3. Meteorological Data for last 5 years (month-wise statement can be furnished) — Climate/Temperature & Rainfall data in E.K.Hills have been indicated in the Status paper
   - Average rainfall, Highest and Lowest
   - Main rainy season (months) — April to October
   - Mean temperature, Maximum temperature and Minimum temperature. — Annual - 25°C, maximum - 35°C, minimum - 0°C.

4. - Altitude range in the State — about 5,200 ft
   - No. of major/minor/medium and lakes — 4.
     Give location District/PHC-wise. — 1) Umiam, 2) Barapani Lake — E.K.Hills
     1) Thadlaskein - Jaintia Hill

5. Demographic Data

Total Population (as per 1991 census) - 17 60636 (Provisional)

Rural 1432000

Urban 329000

Tribal (ST) 10,76,345

Sex ratio — State as a whole 947 : 1000 (F : M)

in Rural area

in Tribal area

Density of Population

In whole State 75 per sq km

in Rural area

in Tribal area

Literacy rate — Rural / Urban / Tribal

Male 51.57 (provisional)

4826 , Female 24.75 (provisional)

6. Brief history of Malaria programme in State highlighting current situation of Malaria in the State.

The Malaria Eradication programme is operational in the State since the inception of the State in 1972. The topography of the State being hilly is very much disturbed population. Malaria was predominantly a disease in the plain areas adjoining Bangladesh, Brahmaputra valley. The State also has its ups and downs in its success in controlling Malaria. Along with the creation of the Govt. of Sikkim - The modified plan of operation was started in 1977.

The State has now 4 districts but the Govt. of India has till date sanctioned only 2 Malaria units in 3 Districts Namely. The increase in population, various developmental works, road construction and minor irrigation and unscientific extraction of sand from private fields have all contributed to the creation of fertile soil for breeding of mosquitoes and spread of Malaria. Inadequacy of infrastructure to cope with 4 Districts in Sikkim unit is the salient cause of not showing in achieving the good control / mitigating Malaria.

Through Epid. is a Reduction of disease (0.49 in PF - 34.12 in 1991-92. the figures cannot be taken as absolute in view of inability to effectively cover the whole State in Data collection and effective surveillance due to remote

7. Organizational Data

Please give organogramme for State, District, PHC.

	Whole state	Tribal
No. of Divisions	10	
No. of Revenue districts	7 (Sikkim)	
No. of Malaria districts or units	3 (Shri) Malaria Distt.	
No. of Blocks	30	
No. of Towns and Cities	12	
No. of villages	1902	

8. Health institutions

	State	Tribal area
1. No. of Hospitals	23	
2. No. of Dispensaries Govt.	NA	
Local Body		

	State		Tribal	
	Required as per norm	Functioning	Required as per norm	Functioning
CHC	35	5	35	5
PHC	16	68	16	68
Sub centres	3	256	3	286
FTDs	287	271	237	271
DDCs	616	472	616	472.

National norms for institutions and staff enclosed.

taff Position as on 1.9.92

e of Post	No. required as per norms of Govt. of India	No. sanctioned	Vacant	In Malaria trained or not trained	Pay scale	Remarks
State level	1	1	NIL	Not Trained	3000-4500/-	
te Programme Officer	1	1	NIL	Trained	2600-4575/-	
te Entomologist						
ıer offices and ıff at HQ such as :rks, Accountant, ı. Tech. Statis- :ian etc.	1	1	-	--	1750-3230/-	
'e category-wise						
Zonal level						
ıal Officer Malaria						
ıal Entomologist						
ı.Technician						
sect Collectors						
ivers						
her Staff						
c District						
MO/DCMO						
y. CMO/DCMO						
MO	3	3	1	Trained	1500-3600/-	
sst. Malaria Officer	3	3	1	Trained	1150-2575/-	
Malaria Inspectors	20	20	-	Trained	1050-1735/-	
Lab. Technicians	26	26	-	Trained	[illegible]	
Insect Collectors	12	12	-		975-1550/-	
Drivers						
Other Staff						

9. PHC Staff Position as on 01-9-92

9a Name of post	No. required as per norms	Sanctioned	Functioning
1. Medical Officer	57	67	44
2. Lab. Tech. Asst.	1	26	68 26
3. L.H.V.	1	48	68 48
4. A.N.M.	1	186	68 172
5. Health Supervisor / Health Asst.) Male		40	29
6. H.F.W. Male		31	—
9c Village health guides		1296	
9d No. of ICDS Blocks		26	
No. of Anganwadi workers		1174	

Norms of Government of India given in enclosure.

10. TRAINING

Give Malaria training status of following staff:

Category	Total No.	Trained	If Where	Untrained
- Medical Officers				
- Multipurpose supervisors Male				
- Multipurpose supervisors Female				
- M.P.W. Male				
- M.P.W. Female				
- Lab. Technicians				
- Malaria Inspectors				
- Entomologists				
- Malaria Officers				
- Asstt. Malaria Officers				

Reports is being collected this will be sent as soon as available

11. Please list the training facilities available for training and retraining the various categories of post:

11.1 Male MPHW

11.2 Laboratory Technicians

11.3 MPHA - Male

11.4 MPH Worker (Male)

11.5 MPHA (Female)

11.6 MPHW (Female)

11.7 Malaria Inspector

11.8 Medical Officer

There is one Regional Family Welfare Training Centre, with a Principal and trained teaching staff located at Shillong-part where month monthly basis training are imparted to all categories of staff of the state in the batches.

12. Financial Data

Year	Required as per technical need	Central allocation	State allocation	Provision made in State budget	Amount actually made available by state during the year	Date of release of funds	Actual expenditure out of state funds: Total	Purchase of Insecticide	On employing spray teams	Other contin. expenses
1985-86	71.42.570	45.00000	45.00000	90.00000	90.00000	4/85 Letter No. G.27017/1/85-B(Vol.II) dt. 27.3.86		Purchase of Insecticides	6 Nos. Spray Pumps.	
1986-87	81.08.316	50.00000	50.00000	100.00000	100.00000	G.27017/1/86-B(Vol.II) dt. 30.3.87	41.02.316			
1987-88	95.23.132	52.00000	52.00000	116.00000	116.00000	G.27017/1/87-B dt. 30.10.87	95.23.132			
1988-89	125.84.572	62.00000	62.00000	124.00000	124.00000	G.27017/1/88-B dt. 17.2.89	124.00.000			
1989-90	134.54.000	70.00000	70.00000	140.00000	140.00000	G.27011/1/89-HAL(A) dt. 5.6.89	138.40.000			
1990-91	130.67.696	65.00000	65.00000	130.00000	130.00000	G.27011/1/90-HAL(A) dt. 30.5.90	130.34.696	Purchase of Insecticides		
1991-92	97.13.542	45.00000	45.00000	90.00000	90.00000	G.27011/1/91-HAL(A) dt. 10.3.92	47.42.542			

N.B — The expenditure excluding cost of pesticides supplied by C.P.I. Jeedimetla by R.B.

Give separately a note on the constraints you experience in timely release of funds (during last 3 years (1990-92)

13. EPIDEMIOLOGICAL DATA (1985 to 1991) State:

Year	Population	B.S. collected	B.S. Exd.	Total +ves	PF.	ABER	SFR	API	PF%	%RT Given	No. of cases in age group 01	No. of cases in age group 1+4	Remarks Deaths /
1985	1514715	2c9389	2c9359	12560	7682	13 8	4.6	8 2 .	77.03	97.5	312	2·620	—
1986	1529862	233137	233137	14687	11711	15.2.	5·02	9·6	79·7	96·6	360	3217	7
1987	1611773	197944	197944	10975	7497	12·5	4·04	6·9	72·8	97·4	204	2375	1
1988	1604471	199797	199797	11363	8743	12·4	4·3	7·3	73·7	91·4	294	2621	
1989	1653562	196898	196898	10701	7767	11·8	3·9	6·4	73·5	83·2	264	2003	
1990	1730657	147756	147756	8209	5691	8·5	3·8	4·7	69·3	87·8	237	1537	
1991	1763248	208872	208872	11155	7497	12·4	3·5	6·6	67·2	94·1	307	2064	

Similar data for District/PHC

14. STATE SPRAYING DATA

Year	Rounds	Total Pop.	Pop. of Area 2 API & above	Pop. projected for spray	Pop. covered	Period of Spray From	To	Achievements Targeted Rooms	Targeted CS	Sprayed Rooms	Sprayed CS	% coverage Rooms	% coverage CS	Insecticide consumed MT
1985	1st Rd.	1560457	753837	955704	609645	1-3-85	31-5-85	462277	557[illegible]	301555	[illegible]	64.6%	73.2%	77725 1/2
	2nd Rd.	1508073		916602	565158	1-7-85	31-585	454514	5[illegible]12	27[illegible]	38[illegible]	64.6%	76.9%	74766
1986	1st Rd	1532775	577542	945752	634015	1-3-86	1-7-86	458766	6[illegible]56	3[illegible]	[illegible]	62.6%	78.5%	74152
	2nd Rd	1532775		718833	448622		1-7-86	361072	42[illegible]	21[illegible]	[illegible]	59.7%	70.4%	58709
1987	1st Rd	1584775	670991	937057	605442	1-3-87	10-6-87	492028	59[illegible]	27[illegible]	[illegible]	55.9%	67.1%	74261
	2nd Rd	1584775		401412	333899	15-7-87	31-10-87	200257	20[illegible]	9925	[illegible]	49.0%	74.0%	36421
1988	1st Rd	1665662	790111	930895	597064	25-6-88	25-6-88	5[illegible]50	63[illegible]	29[illegible]	[illegible]	53.6%	75.2%	71171
	2nd Rd	1665662		925843	601141	31-10-88	31-10-88	477555	60572	27[illegible]	[illegible]	53.0%	74.0%	55426
1989	1st Rd	1655764	815455	950031	631616	1-3-89	16-5-89	413847	61[illegible]	3[illegible]	[illegible]	58.4%	75.8%	60996
	2nd Rd	1655764		1003563	615933	1-8-89	21-10-89	490446	1[illegible]	52[illegible]	[illegible]	59.7%	69.4%	10249
1990	1st Rd	1709573	719696	962559	695138	1-3-90	6-6-90	579319	61474	32[illegible]	[illegible]	61.87%	77.5%	70826
	2nd Rd	1709573		1022944	642393	3-9-90	15-10-90	502555	5734	29[illegible]	[illegible]	58.8%	77.5%	61546
1991	1st Rd	1755574	760526	969511	637207	1-3-91	30-5-91	477464	6[illegible]	30[illegible]	[illegible]	60.9%	73.8%	61375
	2nd Rd	1755574		586394	593624	6-9-91	15-10-91	446478	61[illegible]	28[illegible]	[illegible]	60.8%	75.6%	53021

A similar information in separate sheet for each District and each PHC.

15. Logistics data

Vehicles

	No. required as per norms (N.P.O.)	No. available	On Road	No. required as replacement
Jeeps	7	6	6	1
Pick-ups MINI TRUCK	3	3	3	—
Motor-cycles MARUTI GYPSY	1	1	1	—

Give separately for State HQ, Zonal level, District level, Zonal entomologist

Microscopes	No. required	No. available	No. Out or order	New required
for States & District-wise				
Khasi Hills	11	16	4	
Jaintia Hills	6		2	
Garo Hills	21	24	5	
	38		11	

Microglass slides: State level	Annual requirement	Procured
1989	— NIL —	
1990		
1991		

Spray Pumps:	Required	Available	Procured
1989	135—141	140	
1990	124—124	222	
1991	240—116	731	

Anti Malarials 4 AQ	Required	Supplied by Govt. of India	Consumed
1989 Amodiaquine	10.00000	10.00000(20.6.89)	11,79000
1990 Amodiaquine	10.00000	5 00,000(17.10.90)	6.00.000(2,00,000 taken from D.H.S Gauhati 6.00000
1991 Amodiaquine	300000	1,96,000(7.3.91)	
		300000 (1e10 91)	
		696000	

Annexure - 6

STATE N.M.E.P.

ORGANISATIONAL DATE

Name of State : ARUNACHAL PRADESH

State Data

1.	Population of 1991 census	== 631839
2.	Number of Divisions/Zones	= 2 ZONE
3.	Number of Districts	= 12
4.	Number of NMEP Units	= 4
5.	Number of Blocks	= 48
6.	Number of PHCs	= 28 + 4
7.	Number of Villages	= 3257

Tribal Data

(Based on Tribal Sub-plan, Government of India)

1.	Population of Tribal Area	= 631839.
2.	Number of Tribal Districts	= 12 Distt.
3.	Number of Tribal Blocks	= 48.
4.	Number of Tribal PHCs	= 28 + 4
5.	Number of Tribal Units	= 4 Units.
6.	Number of Tribal Villages	= 3257.

Staff Position under State NMEP (as on 1.9.1992:)

Sl No.	Category	No. Sanctioned	In Position	Vacant (%)	
1.	State Programme Officer(Malaria)	1	1	-	
2.	State Entomologist	1	1	-	
3.	Zonal/Divisional Medical Officer(Malaria)	1	1	-	
4.	Biologist	-	-	-	
5.	Distt. Malaria Officer	3	1	2	
6.	Asstt. Malaria Officer	7	7	-	(12 Nos. SMO).
7.	Zonal Entomologist	Asstt. Ent. 2	2	-	
8.	Malaria Inspector	41	41	-	
9.	Laboratory Technician	12	10	2	(7 post of Microscopist vacant).
10.	Insect collector	7	5	2	
11.	Multipurpose Worker(male)DHV	171	171	-	(DHV)
12.	Malaria Sub Inspector	44	44	-	
13.	Surveillance Inspector	24	24	-	

STAFF POSITION UNDER TRIBAL AREAS (AS ON 1.3.1992)

Sl No	Category	No Sanctioned	In Position	Vacant (%)
1.	Zonal/Divisional Medical Officer(Malaria)	1	1	-
2.	Distt. Malaria Officer	3	3	-
3.	Asst. Malaria Officer	7	7	-
4.	Zonal Entomologist	Asst. 2	2	-
5.	Malaria Inspector	41	41	-
6.	Laboratory Technician	12	10	-
7.	Insect Collector	7	5	-
8.	Multipurpose Worker(male)DHV	171	171	-
9.	Malaria Sub Inspector	44	44	-
10.	Surveillance Inspector	24	24	-

TRANSPORT POSITION

Transport Postion in State (as on 1.9.1992).

Type	No. Required under MPO	Rodworthy	Off road	New required
Jeep	15	10	5	5
Jeep Pick-up	6	3	3	2
Truck	-	-	-	1
Motor Cycle	-	-	-	-
Any other	Gypsy Gypsy 1	1	-	-

Transport posbition in Tribal Areas (as on 1.9.1992)

TYpe	No. required under MPO	Readworthy	Off road	New required
Jeep	15	10	5	5
Jeep Pick-up	6	3	3	.2
Truck	-	-	-	1
Motor cycle	-	-	-	-
Any other	Gypsy 1	1	-	-

EPIDEMIOLOGICAL DATA

Epidemiological situation in the state

	1987	1988	1989	1990	1991
Number of Malaria cases	16959	19254	20865	18227	18729
ABER	31.92%	28.89%	21.96%	25.29%	26.76
API	24.64%	27.54%	28.78	24.28%	26.48
SFR	1.73%	1.70%	1.71%	1.16	1.69
P.f %	22.40%	17.96%	13.06%	12.15	17.18
Deaths	-	2	-	1	-

Epidmiological situation in Tribal Areas.

	1987	1988	1989	1990	1991
Number of Malaria cases	16959	19254	20865	18227	18729
ABER	31.32%	28.89%	21.96%	25.29%	26.76
API	24.64%	27.54%	28.78	24.28%	26.48
SFR	1.73%	1.70%	1.71%	1.16%	1.69
P.f %	22.40%	17.86	13.06%	12.15	17.18
Deaths	NIL	2 No	-	1	-

SPRAY DATA

(as per the State NMEP policy)

97

DDT Spray Data (State)

1. No. of Districts under DDT Spray	11
2. No. of PHCs under DDT spray	18
3. No. of Sections under DDT spray	141
4. Total population under DDT spray	657135

DDT Spray Data (Tribal areas)

1. No. of Districts under DDT Spray	11
2. No. of PHCs under DDT spray	18
3. No. of Sections under DDT spray	141
4. Total population(Tribal) under DDT Spray	657135

DHC Spray Data (State)

1. No. of Districts under BHC Spray	-
2. No. of PHCs under BHC spray	-
3. No. of Sections under BHC Spray	-
4. Total Population under BHC spray	-

BHC Spray Data (Tribal areas)

1. No. of Districts under MX BHC Spray	-
2. No. of PHCs under BHC Spray	-
3. No. of Sections under BHC Spray	-
4. Total Population(Tribal) under BHC Spray	-

MALARIA OUTBREAKS

Focul outbreaks of Malaria in State (1987-1991)

Year	No. of outbreaks in State/Tribal areas		No. of confirmed cases in state/Tribal areas
1987	+	-	-
1988	+	-	-
1989	2		141
1990	1		684
1991	1		295

Information from States required for Task Force.

1. Maps of the State showing — Map & list enclosed
   - Geographical features
   - Zones and Districts with their H.Q.
   - High incidence Districts marked with colour 1990 API, ABER, Pf% in each District
   - Pf. Resistance foci
   - Areas under insecticide spraying Malathion, BHC, DDT mark by colour.
   - Vectors if more than one.

2. Total area of the State in Sq. Km. : 84000 Sq. Km.
   Percentage of State's total area
   - Hill area Sq. Km. : 171040.00 Sq. Km.
   - Forested area Sq. Km. : 03.44 Lac Hectr. Specific area
   - Cultivated area in hectars : 0174 Hectr Lac
   - Rice cultivated area in hectars → : 95000 Hectrs
   - Irrigated area in hectars → : 3,000 Hectrs.

3. Meteorological Data for last 5 years (month-wise statement can be furnished)
   - Average rainfall, Highest and Lowest : 265880 mm 339 04
   - Main rainy season(months) : April to Oct.
   - Mean temperature, Maximum temperature, Minimum temperature. : Not available.

4. A Altitude range in the State : 1200 - 14000 Ft.
   - No. of major/minor/medium and lakes : 354 Hectars.
     Give location District/PHC wise.

5. Demographic Data
   Total Population (as per 1991 census) : 590411
   Rural : 41428
   Urban : 631339
   Tribal : 861 Per thousand Male.
   Sex ration State as a whole : 861 Per thousand Male.
   in Rural area : - do -
   in Tribal area :

   Density of Population
   In whole State : 10 Per Sq. Km.
   in Rural area : 10 Per Sq. Km.
   in Tribal area : 10 Per Sq. Km.

   Literacy rate — Rural — Urban — Tribal : 32.86 as per 1991 Census

	Rural	Urban
1991		
Male	41.34	X
[illegible]	0?	X

6. Brief history of Malaria Programme : in State highlighting current situation of Malaria in the State.

7. Please give organogramme for State : 32.
District, PHC.

	Whole State	Tribal
No. of Divisions/Districts :	12	
No. of Revenue Districts :		
No. of Malaria districts or units :	4 Units	4 Units
No. of Blocks :	48	
No. of Towns and Cities :	6	
No. of villages :	3257	

8. Health institutions

	State		Tribalarea	
1. No. of Hospitals - 10 :	10		10	
2. No. of Dispensaries Govt. :	29			
Local Body :	-			

	State		Tribal	
	Required as per norm	Functioning	Required as per norm	Functioning
CHC	4 + 1	4 + 1	-	-
PHC	32	32	-	-
Sub centres	132	132	-	-
FTDs	126	126	-	-
DDCs	107	107	-	-

107

National norms for institutions and staff enclosed.

Contd.....3/-

9. Staff Position as on 1.9.92.

Name of Post	No. required as per norms of Govt. of India	No. sanctioned	Vacant	In Malaria trained or not trained	Pay scale	REMARKS.
9a State level.						
- State Programme Officer	1	1	-	Trained		
- State Entomologist	1	1	-			
- Other offices and staff at HQ such as Clearks, Accountant, Lab. Tech. Statistician etc. give category wise:-						
Supdt/Accountant.:	6	6	-			
Storekeeper :	3	3	-			
U.D.C. :	1	1	-			
L.D.C. :	1	1	-			
9b Zonal level						
- Zonal Officer Malaria	1	1	-			
- Zonal Entomologist	1	1	-			
- Lab. Technician	1	1	-			
- Insect Collectors	2	2	-			
- Drivers	3	3	-			
- Other Staff Peon	4	4	-			
9c District						
CMO/DCMO						
Cy. C.M.O./DCMO						
D.M.O.	3	3	2			
Asst. Malaria Officer	7	7	-			
Senior Malaria Inspector	12	12	2			
Malaria Inspectors	44	44	-			
Lab. Technicians	12	12	2			
Microscopist	7	-	7			
Insect Collectors	7	5	2			
Malaria Sub Inspector	26	28	-			
Drivers	13	13	-			
Oother Staff Peon	23	23	-			

Contd.....2/-

9. PHC Staff position as on 01.9.92.

9d. Name of post	No. required	Sanctioned	Funcitioning
1. Medical Officer	1	1	1
2. Lab. Tech. Asst.	1	1	1
3. L.H.V.	-	-	-
4. A.N.M.			
5. Health Supervisor (M) / Health Asst. (M)	Male -		
6. M.P.W.	Male		
9c. Village Health guides			
9f. No. ICDS Blocks	37	37	37
No. of Anganwadi Workers			

Norms of Government of India given in enclosure.

Contd.....5/-

15. Logistics data

Vehicles	No. required as per norms (M.P.O.)	No. available	On Road	No. required as replacement
Jeeps	15	15	10	5
Pick-ups	6	6	3	3
Motor Cycles	4	-	-	4
Any other - Gypsy	1	1	1	

Give separately for State HQ. Zonal level. District level. Zonal entomologist

Microscopes	No. required	No. available	No. Out or order	New required
for States & District-wise	30	28	5	7

Microglass slides State level	Annual requirement	Procured	
1989	1106 Gross	50 Gross from local market	Managed from existing B/Slide
1990	1319 Gross	690 Gross "D" NMEP Supply	- DO -
1991	1300 Gross	NIL	- DO -

Spray Pumps	Required	Available	Procured
1989	-	165	NIL (Previous Balance)
1990	-	-	-
1991	191	235	191 Nos.

Anti Malarials	Required	Supplied by Govt. of India	Consumed
4 AQ 1989	8.00 Lakhs	6.00 Lakhs	5.70 Lakhs
1990	8.00 Lakhs	7.00 Lakhs	6.25 Lakhs
1991	8.00 Lakhs	7.00 Lakhs	6.50 Lakhs.

8Qino Tablets	Required	Supplied by Govt. of India	Consumed
1989	3.00 Lakhs	2 Lakhs	1.70 Lakhs
1990	3.00 "	3 "	1.50 "
1991	3.00 " 2	0.45 Lakhs	1.70 "

Quinine Ampules Give availability and Distribution list for two years 1990, 1991.

Insecticiaes	Requirement	Procured	Supplied by Govt. of India	Consumed
1989	-	-	80 MT	75% = 8938 kg. DDT
			50%	50%= 96518 kg.
1990	-	-	130 MT	75%= 725kg. DDT
			50%	50%= 91882kg.
1991	-	-	73 MT	78%= 47725 kg. DDT
			50%	50%= 98303kg.

10. TRAINING

Give Malaria training status of following staff.

Category	Total No.	Trained	Where	Untrained
- Medical Officers	1	1	Kimin	
- Multipurpose supervisors Male	-	-	-	
- Multipurpose supervisors Female	-	-	-	
- M.P.W. Male	-	-	-	
- M.P.W. Female	-	-	-	
- Lab. Technicians	10	10		
- Malaria Inspectors	41	41		
- Entomologist	1 - 2	1 - 2		
- Malaria Officers	1	1	Tezu	
- Asstt. Malaria Officers	7	7		

11. Please list the training facilities available for training and retraining the various categories of post.

11.1 Male MPHW

11.2 Laboratory Technicians

11.3 MPHA - Male

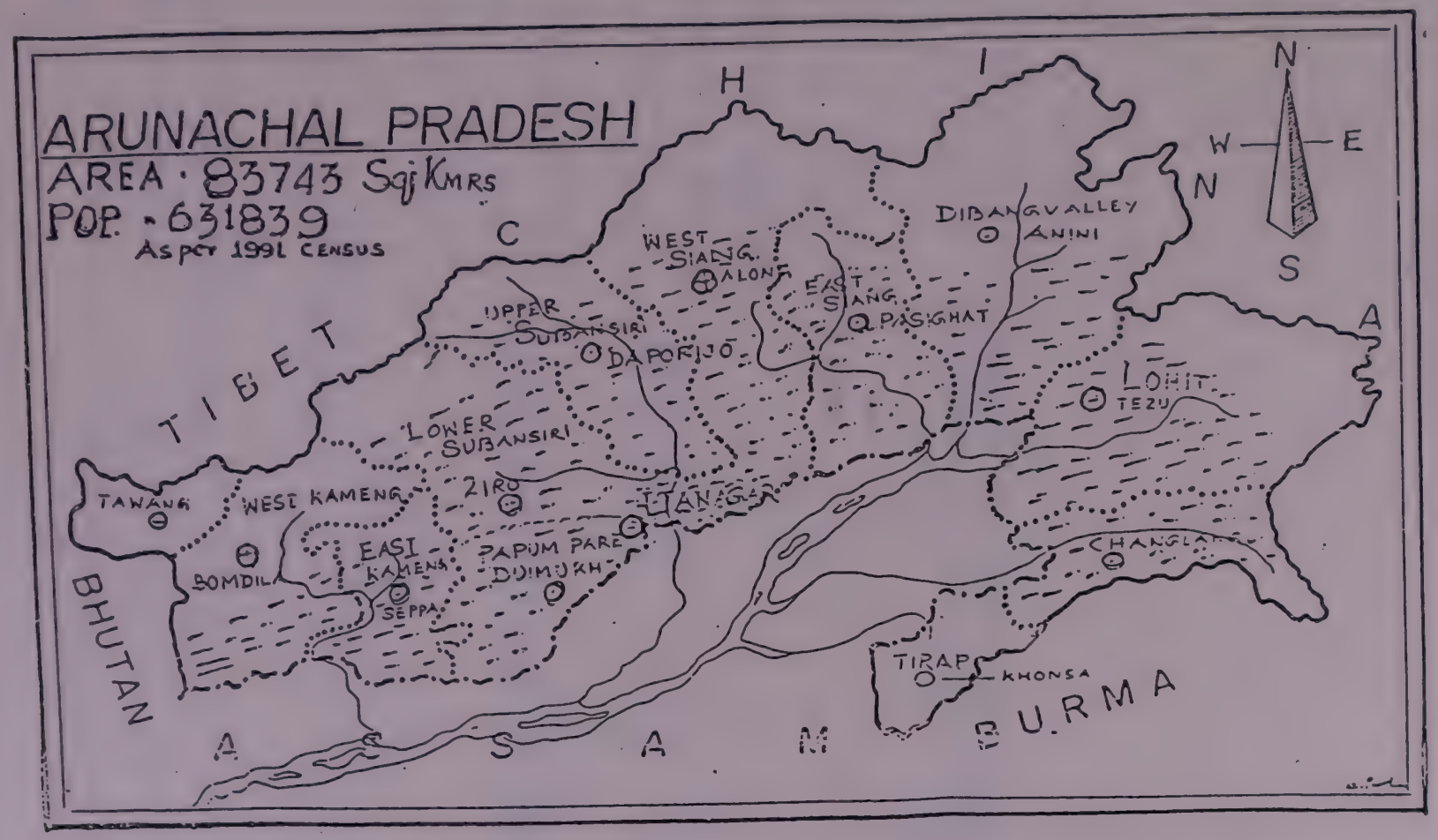
11.4 MPH Worker(Male)

11.5 MPHA(Female)

11.6 MPHW(Female)

11.7 Malaria Inspector

11.8 Medical Officer



SL NO	NAME OF DISTRICT	HEADQR
1	TIRAP	KHONSA
2	CHANGLANG	CHANGLANG
3	LOHIT	TEZU
4	DIBANG VALLY	ANINI
5	EAST SIANG	PASIGHAT
6	WEST SIANG	ALONG
7	UPPER SUBANSIRI	DAPORIJO
8	LOWER SUBANSIRI	ZIRO
9	EAST KAMENG	SEPPA
10	WEST KAMENG	BOMDILA
11	TAWANG	TAWANG
12	PAPUM PARE	DUIMUKH

(Newly Established district)
Not yet functioning.

1990 APStat
API = 26·48%
ABER = 26·76%
PF% - 17·18

INSECTIDE USED = DDT 50%
MALATHION =

14. STATE SPRAYING DATA

Year	Rounds	Total Pop.	Pop. of Area 2 API & above	Pop. projected for spray	Pop. covered	Period of Spray From	Period of Spray To	Achievements Targeted Rooms	Achievements Targeted CS	Achievements Sprayed Rooms	Achievements Sprayed CS	% coverag Rooms	
1985	2(Two)	67092	539944	539944	360352	16th AM	30th	293538	56977	204347	41352	69.61%	72.
					402109	1/7	75/9	300472	59249	220051	47608	73.23%	80.
1986	2(Two)	680908	560997	560997	443004	16th AM	30th	293166	53623	221520	44754	76.56%	89.
					448154	1/7	75/9	293166	53623	212243	42465	74.00%	79.
1987	2(Two	689193	58853	58853	462342	16th AM	30th	286185	49714	217729	4233	76.07%	85.
					423260	1/7	75/9	30155	51025	204477	39155	67.80%	76.
1988	2(Two)	545037	545037	45037	456228	16th AM	30th	275811	60952	199863	46392	72.46%	76.
					426560	1/7	75/9	283335	45780	201824	40611	71.23%	88.
1989	2(Two)	699061	529971	529971	409920	16th AM	30th	266109	54054	188587	42654	70.86%	78.
					413102	1/7	75/9	266109	54054	197479	43469	74.20%	80.
1990	2(Two)	718869	606733	606733	292722	16th AM	30th	211603	47716	143819	37395	67.9%	78.
					328308	1/7	75/9	23793	47564	157840	37071	66.3%	77.
1991	2(Two)	718869	520724	520724	342813	16th AM	30th	250516	57783	46283	6583	65.83%	80.
					323206	1/7	75/9	231925	53886	153083	39150	72.66%	72%

** A similar information in separate sheet for each District and each PHC.

13. EPIDEMIOLOGICAL DATE (1985 to 1991). State :- Arunachal Pradesh.

Year	Population	B.S. Collected	B.S. Exd.	Total +Ves	PF.	ABER	SFR	API	PF%	%RT given	No. of case in age group 01	1+4
1985	680908	236302	236302	24896	5015	34.70%	2.12%	36.56%	20.14%	23399 93%	352	2670
1986	680531	231985	231985	21810	4156	34.08%	1.79%	32.04%	19.05%	19207 88.06%	442	2393
1987	688027	218987	218987	16959	3516	31.82%	1.73%	24.64%	22.40%	15098 89.02%	1346	3468
1988	699061	201588	201588	19254	3007	28.83%	1.70%	27.54%	17.86%	17111 88.86%	230 28	1785 303
1989	724846	159205	159205	20865	2765	21.96%	1.71%	28.78%	13.06%	19012 @ 91.11%	273 20	2200 270
1990	750593	189839	189839	18227	2215	25.29%	1.16%	24.28%	12.15%	15729 86.29%	238 20	1825 221
1991	707269	189295	189295	18729	3218	26.76%	1.69%	26.48%	17.18%	12895 68.85%	200 14	1589 155

Similar date for District/PHC.

Annexure-7

MCP FORM NO.1

REPORT ON BLOOD SLIDE COLLECTION (BSC), EXAMINATION (BSE) AND RADICAL TREATMENT
(ORIGINATES FROM MPH WORKERS-MALE; FEMALE/MPH SUPERVISOR M,F/FTC/MC/LT)

NAME OF HEALTH SUB-CENTRE_____ NAME OF PRIMARY HEALTH CENTRE_____

ITS CODE NO._____ NAME & CODE OF STAFF REPORTING_____

PASSIVE AGENCY_____

ITS POPULATION CENSUS (1991)_____

ITS ENUMERATED POPULATION (19)_____

Name of village/ street or slum in town	House hold number & door No.	Name of the patient	Age/ Sex (x)	S.No. of blood slide	Presumtive treatment given: 'Yes' or 'No'	Date of onset of fever	Date of BSC	Date of BSE	Results of BSE			Positive case No. for PHC/ town/ Leprosy	Date of Communication of result	Radical treatment			If died date of death	Remarks
									Pv	Pf	Pm			By whom	From	To		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Signature and Name of
Blood Slide Collector

Signature and Name
of Microscopiest/L.T.

Date of Despatch
to Lab.

Date of Receipt at PHC Lab.

Note: (x) Indicate for females, if she is pregnant by rounding that entry.

Annexure-8

MCP-FORM 2

MONTHLY REPORT FOR THE MONTH OF_____, 199

CENSUS POPULATION FOR REPORTING UNIT :

ENUMERATED POPULATION FOR REPORTING UNIT :

1. NAME OF STATE :
2. NAME OF DISTT. :
3. NAME OF PHC :
4. NAME OF URBAN LOCALITY :
5. NAME OF HSC :

Sl.No. & Name of reporting Units	1991-C Population	RESULTS OF BSC AND BSE											
		ACTIVE			PASSIVE			MASS			TOTAL		
		BSC	BSE	+VE	BSC	BSE	+VE	BSC	BSE	+VE	BSC	BSE	+VE
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1.													
2.													
3.													
4.													
TOTAL													

Monthly Blood Exam Rate (MBER)	Monthly Parasite Rate (MPI)	Sex of Patient		AGE DISTRIBUTION OF PATIENTS										No. given RT		No. died due to Malaria
				Pv					Pf AND MIXED					Pv	Pf	
		Male	Female	0-1	1+5	5+15	15+	Total	0-1	1+5	5+15	15+	Total			
15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.

In Col. 31 : Note the number of Death(s) decided/diagnosed as due to Malaria, that were noticed (detected/ionformed/registered) during the month under report.

Signature of Official preparing the repot

Signature & Name of MOPHC/or reporting Officer

Date of preparation:

Annexure-9

MCP - FORM NO.3

REPORT ON "ROUND SPRAY" OPERATIONS UNDER MALARIA CONTROL

NAME OF THE STATE :
NAME OF THE DISTRICT :
NAME OF THE PHC :
TOTAL POPULATION OF PHC :

NAME OF H.SUPERVISOR

NO. OF HSCS IN THE PHC

Sl No	Name of HSC and Code No	Total Popln	Popln of houses sprayed	Insecticide used	No. of rounds	Period of Spray rounds		Target		Sprayed		% covered		Quantitity of Insecticide sprayed	Balance stock of insecticide	Last 3 years API of the area	Remarks
						From	To	Rooms	CS	Rooms	CS	Rooms	CS				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1					1st												
					2nd												
					3rd												
2					1st												
					2nd												
					3rd												

Date :

Signature of MPHS

Signature and Name of
MO of PHC
HO of Urban Area

Note : Col. 4 : Give population of houses actually sprayed : Col.3 gives total population of all houses targetted for spray.

Col.11,12 : Shall include only those rooms & cattle sheds (C.S.) Fully covered by 'SPRAY'.

Co. 17 : Gives API of the Section for Last Three years.

Annexure-10

HCP FORM NO. 4
REPORT ON "FOCAL/SPECIAL" SPRAY

NAME OF THE STATE :
NAME OF THE DISTRICT :
NAME OF THE PHC :

NAME OF THE MPHS (MALE) :
HEADQUARTERS OF MI/SPRAY SQUAD :
NO. OF VILLAGES IN PHC :

Sl No	Name of Village	HSC Code No.	Total popln of village	No. of malaria cases	Popln of houses sprayed	Insecticide used	Date of spray	Target		Sprayed		% Covered		Quantity of Insecticide Spent	Remarks
								Rooms	CS	Rooms	CS	Rooms	CS		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Date :

Name and Signature of
Malaria Inspector

Name and Signature of MO of PHC

1. Focal Spray/Special Spray will be decided as per Criteria laid down by directorate.

2. By reviewing F1 & F2, MO PHC will identify where focal spray will be done; or where whole village has to be taken for one round of special spray.

3. At the end of every month, the spray report will be sent to District Malaria Officer or Chief MOH of the district for his study, review and comments - and for his reporting to Zonal and State level.

Annexure-11

MCP - FORM 5
REPORT ON STOCK OF ANTI MALARIALS, INSECTICIDES ETC.

REPORT FOR THE PERIOD FROM_____ TO_____

NAME OF THE REPORTING AGENCY :
AND ITS CODE NO. :

Sl No	Name of Drug Insecticide etc.	Opening Balance			Received during the period	Total of columns 5 + 6	Actual consumption	Closing Balance			Stock sufficient for (indicate period)	Remarks
		At reporting unit	Field stock	Total				At reporting unit	Field stock	Total		
1	2	3	4	5	6	7	8	9	10	11	12	13
1	4AQ:Chloroquine											
2	8AQ:Primaquine 2.5 mg. 7.5 mg. 15 mg.											
3	Quinine tablets											
4	Quinine injectable											
5	Sulfadoxien & Pyrimethamine											
6	Mefloquine											
7	Other antimalarial (specify)											
8	Microslides a. New b. Old reusable											

Sl No	Name of Drug Insecticida etc.	Opening Balance			Received during the period	Total of columns 5 + 6	Actual consumption	Closing Balance			Stock sufficient for (indicate period)	Remarks
		At reporting unit	Field stock	Total				At reporting unit	Field stock	Total		
1	2	3	4	5	6	7	8	9	10	11	12	13
9	JSB-I (mls)											
10	JSBII(mls)											
11	Leishman's stain											
12	DDT 50%											
13	DDT (Tech)											
14	B-C 50%											
15	Malathion W.W.											
16	Malathion (tech)											
17	Others (specify)											

Date :

Name & Signature of reporting official

Note:

1. HCS will fill Col.No.4 and 10 getting the particulars from FTC, MC, etc. HCS's stock will be entered in Co.3, and Col.9. In Col.8 the total drugs consumed in the HSC area through dispensaries, FTC, MC and thrcugh dispensation by MPHW to patients will be noted.

2. PHC will fill Col. 4 and 10 getting the particulars in this proforma form HSCs, MPH Supervisors, and Malaria Inspectors and/or spray treams.

3. Indicate in remarks col. quantity of drugs etc. that can not be utilised within the stipulated shelf-life.

Periodicity

HSC to PHC : Monthly
PHC to DHO : Monthly
DHO to Zone/State : Quarterly
State to national level -) Half Yearly

511

Annexure-12

NAME OF STATE :
NAME OF DISTRICT :
NAME OF PHC :
NAME OF UMS :

MCP-FORM 6
STATEMENT OF VEHICLE AND EQUIPMENTS UNDER MCP
REPORT FOR THE HALF YEAR ENDING 30.6.199 /31.12.199

Type of Vehicle or Equipment	Total at end of last Half-year			Condemned/removed during this half-year	New vehicle or equipment put in the prog. during this half year		Total available at the end of half year			Remarks
	RW/S	NRW/NS	Total		Replacement	De Novo	RW/S	NRW/S	Total	
Jeeps										
Pick ups										
Motor cycles										
Trailors for jeeps										
Other vehicles specify										
Stirrup pumps										
Buckets										
Knapsack Sprayers										
Compression Sprayers										
Fogging Machine Specify										
Microscope										
Spare oil immersion objective										

Note : 1. STRIKE OUT WHAT IS NOT APPLICABLE - NRW: NOT ROAD WORTHY - S: SERVICABLE - NS: NOT SERVICABLE.

Annexure-13

MCP - FORM 7
REPORT ON HUMAN RESOURCES

REPORT FOR THE PERIOD ENDING:

NAME OF THE STATE :
NAME OF THE DISTRICT :
NAME OF PHC/UMS :

S.No.	Designation of the post	No. of eligible posts as per norms	No. of posts sanctioned	No. of posts filled up on referrence date	No. of staff who have the prescribed training	Remarks
1	2	3	4	5	6	7

Date :

Signature :

Name & Designation:

4

Annexure-14

MCP F8
MONTHLY EXPENDITURE STATEMENT OF MCP

NAME OF THE STATE :
NAME OF THE DISTRICT:
NAME OF PHC :
NAME OF UMS :

FOR THE MONTH OF:_____199

A. PLAN EXPENDITURE

Period	Pay	Dearness Allowance	Travelling or Daily Halting allowance	Other Allowances	POL for Vehicles	Petrol, Diesel, SKO for spraying or fogging	Wages of non seasonal mazdoors	Cost of insecticides/ larvicides	Other contingenices	Total
Annual Allocation										
Current Month										
Progressive Total for financial year										

B. NON-PLAN EXPENDITURE

Period	Pay	Dearness Allowance	Travelling or Daily Halting allowance	Other Allowances	POL for Vehicles	Petrol, Diesel, SKO for spraying or fogging	Wages of non seasonal mazdoors	Cost of insecticides/ larvicides	Other contingenices	Total
Annual Allocation										
Current Month										
Progressive Total for financial year										

NOTE: * STRIKE OUT WHAT IS NOT APPLICABLE

1. Plan Expenditure is for plan period. For VIIIth plan from 1.4.1990 only items approved as plan expenditure by GOI is to be shown under this heading. All other expenditures will be Non-Plan expenditure.
2. District Statement will include expenditure (i.e. bills encashed) per SE by District Office plus the expenditure incurred by the constituent PHCs & UHS in the District plus of the Zonal Office situated in the district.
3. State expenditure will include expenditure on malaria control programme at State Office plus the expenditure in the consolidated expenditure statement of the districts in the state.
4. The statements in the first instance will be unreconciled data. Reconciled statement can be sent soon after reconciliation once in a quarter by State Officer to Director, NMEP Delhi.

Annexure-15

SUMMARY OF SUGGESTED FORMATS, THE FLOW OF INFORMATION, PERIODICITY, ETC. UNDER MIS FOR MALARIA CONTROL PROGRAMME

S.No.	Details	Arising from	Stops at	Periodicity	Information on	Indicies for evaluation	Management uses by
Form 1.	Patient wise details. Record on BSC, BSE & RT. etc.	- MPHWs - FTCs - MPHS - MALARIA CLINICS - DISPENSARIES - HOSPITALS	- PHC - URBAN HEALTH AUTHORITY	- TWICE A WEEK TO THE LABORATORY FROM FTCs, FIELD WORKERS (ALONG WITH BSC) - ONCE A WEEK FROM INSTITUTIONS WITH LABORATORY	- BS COLLECTION - BS EXAM AND RESULT - VILLAGE WISE FROM RURAL AREAS - WARD WISE IN URBAN AREAS - DEATH DUE TO MALARIA	- VILLAGE WISE API - VILLAGE WISE ABER - VILLAGE WISE SPR SfR SVP - CHILD PARASITE RATE - INFANT PARASITE RATE	- VILLAGE WISE SURVEILLANCE ACTIVITIY STATUS. - IDENTIFY AREAS REQUIRING FURTHER = STUDIES = ADDITIONAL REMEDIAL ACTION - ASSESS AREAS WHERE SURVEILLANCE IS POOR OR ABSENT CONTINUOUSLY FOR MORE THAN 4 WEEKS - IDENTIFY AREAS WHERE INCIDENCE IS RAISING; - IDENTIFY HIGH INCIDENCE AREAS
Form 2.	Area wise details - Village wise details	HSC	PHC	Monthly (by 1-2)	- Malaria incidence (species wise) - Area wise - Age group wise - RT coverage - death due to malaria	- BER - PI - SPR - SfR - Infant PR - Child parasite rate - Malaria death rate	- Identify Variations in (M) incidence - Identify new villages or areas affected - identify areas where incidence of (M) is increasing; so require special attention to control - To compare epidemiological situation of an area over time.
	- HSC wise details	PHC	Dist.	By 4-5			
	- Street wise details	Division (Sanitary Division of Urban area)	Urban Health Authority	By 1-2			
	- Ward wise details	Urban Health Authority	Dist.	By 4-5			
	- PHC wise and Urban area wise	Dist.	State NMCP Delhi	By 8-10 By 8-10			

S.No.	Details	Arising from	Stops at	Periodicity	Information on	Indicies for evaluation	Management uses by
Form 3.	Area wise spray data (Round spray with residual insecticide)	PHC Dist	Dist State	Monthly Monthly	- Spray activity with reference to schedule dates of round spray - Residual insecticide used - People's acceptance of spray - Impact of spray on reduction of incidence of malaria	% coverage of houses	- Timeliness of coverage - effectiveness of spray on API - Quantity of insecticide used. - to study reasons for late start of spray and arrange to rectify - to study reasons for poor effectiveness of spray by arranging special entomological, human behaviour studies and take further corrective action
Form 4.	Focal Spray	- PHC - Sanitary inspector - UHA - Dist	- Dist - UHA - Dist - State	Monthly Monthly Monthly Monthly	- Spray coverage	% coverage of houses	- Timeliness of focal spray - Reduction of secondary cases
Form 5.	Stock of drugs, stains	- HSC including FTCs - PHC including HSCs - Dist. including PHCs, Hospitals	PHC Dist State	Monthly Monthly Monthly	- Availability - Utilisation - Future requirement		- Review utilisation with activity performed - to arrange for timely supply of needed materials - to direct excess stock to needy areas.

S.No.	Details	Arising from	Stops at	Periodicity	Information on	Indicies for evaluation	Management uses by
Form 6.	Equipments (E) and vehicles (V)	- PHCs including HSC - UHA - Referral Hospital - Dist including PHC, UHA, Major Hospitals	Dist Dist Dist State	Half Yearly Half Yearly Half Yearly Half Yearly	- Availability - Utilisation - future requirement		- to initiate timely action to ensure availability of servicable E & V at the periphery. - to identify less than optimum use of E,V and take corrective action. - to ensure preventive maintenance to lessen "down time" of E & V.
Form 7.	Human Resources	PHC UHA Dist State	Dist Dist State NMCP	Quarterly Quarterly Quarterly Half Yearly	Personnel availabie against norms or needs	% posts filled up	- To identify shortages - To identify training requirements
Form 8.	Financial resources	PHC UHA Dist State	Dist Dist State NMCP	Monthly Monthly Monthly Monthly	Monthly expenditure on various items	Timeliness of Expenditure on purchases and employment of staff.	- Financial control - Seek budgetagy allocation where needed - Keep funding agencies informed.